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Mental Toughness and Health-Related Lifestyle Factors

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Abstract

Mental toughness (MT) originated within elite sport and was identified as an attribute of success. MT has emerged as being important for enhancing health-related lifestyle factors (HRLF; e.g., physical activity). Investigating the healthiness of one's lifestyle appears a timely area to research given the current health status of the population. Therefore, the aim of this thesis was to investigate MT in relation to HRLF and weight loss.

Study One investigated MT and HRLF in university students (n = 167). Self-reported MT, physical activity, exercise barriers, dietary behaviour, and psychological wellbeing were recorded. MT was significantly different between regular exercisers (M = 3.43 ± .42) and non-regular exercisers (M = 3.24 ± .54, p < .05). Components of eating identity, exercise barriers, and psychological wellbeing, were significantly correlated with MT.

Study Two longitudinally investigated weight loss progress, and adherence to a weight loss support group, in slimming club members who were pursuing a weight loss goal (n = 132). MT and eating identity were assessed at baseline, three-months, and six-months, and weight was recorded at weekly meetings. Overall MT was not significantly related to weight loss (r = -.15, p > 0.05) or adherence to the service (r = .03, p > 0.05).

Study Three sampled individuals who held a weight loss goal, but were not attending a weight loss support club (n = 78). Overall MT was not significantly related to weight loss (r = -.21, p > 0.05). MT was not significantly different between weight loss goal achievers (M = 3.62 ± .49) and non-goal achievers (M =3.42 ± .38, p > 0.05). Thus, irrespective of whether structured support is received, overall MT was not related to weight loss progress.

Study Four investigated the experiences of high (n = 9) and low (n = 7) mentally tough individuals pursing a weight loss goal. High and low MT individuals, identified using the MTQ48, were interviewed. Thematic analysis revealed that amongst the high mentally tough individuals, those who prioritised leading a healthy lifestyle reported weight loss success compared to those who prioritised other goals. Strategies to overcome low levels of MT (e.g., control), as well as receive additional support, appeared crucial for successful weight loss in low MT individuals.

Study Five further investigated the low MT individuals' (n = 7) perceptions, experiences, and attitudes, towards weight loss. Low MT individuals were sampled based on their MT score assessed via the MTQ48. Vignette based interviews extended the findings in Study Four. Thematic analysis revealed key findings, including the potential to change low MT individuals' perceptions to enhance behaviour change.

Overall, this thesis expanded the understanding of MT; the processes that one experiences when trying to lose weight appears to differentiate between high and low MT individuals, which offers an explanation as to why MT did not appear to play a significant role in weight loss outcomes. These findings challenged the predominant contemporary understanding of MT and demonstrated that MT was not associated with behaviour change to achieve weight loss.

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List of Abbreviations

Abbreviation	Meaning
α	Cronbach alpha
16PF	16 item Personality Factor (Cattell, 1957)
BMI	Body Mass Index
CFA	Confirmatory Factor Analysis
EBBS	Exercise Benefits and Barriers Scale (Sechrist, 1987)
EITI	Eating Identity Type Inventory (Blake et al., 2012)
ESEM	Exploratory Structural Equation Modelling
FFM	Five Factor Model (Costa & McCrea, 1992)
HAPA	Health Action Process Approach
HBM	Health Belief Model (Hochbaum, 1958)
HMTG	High Mental Toughness Group
HRLF	Health Related Lifestyle Factors
IPAQ	International Physical Activity Questionnaire (Craig et al., 2002)
LMTG	Low Mental Toughness Group
MT	Mental Toughness
MTI	Mental Toughness Inventory (Gucciardi et al., 2013)
MTQ18	Mental Toughness Questionnaire 18 (Clough et al., 2002)
MTQ48	Mental Toughness Questionnaire 48 (Clough et al., 2002)
NHS	National Health Service
PCP	Personal Construct Psychology
PPI	Psychological Performance Inventory (Loehr, 1986)
PHE	Public Health England
PST	Psychological Skills Training

SPWB	Scales of Psychological Wellbeing (Ryff, 1989)
Sten	Score of ten
TPB	Theory of Planned Behaviour (Ajzen & Madden, 1986)
TTM	Transtheoretical Model (Prochaska & DiClemente, 1986)
UK	United Kingdom
WHO	World Health Organisation

List of Publications from This Thesis

Stamp, E., Crust, L., Swann, C., & Perry, J. L. (*in press*). Relationships between mental toughness, barriers to exercise, and exercise behaviour in undergraduate students. *International Journal of Sport Psychology*.

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List of Presentations from This Thesis

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Chapter One: Introduction

Introduction

What is it that separates the successful from the unsuccessful? What is it that makes some persevere in the light of adversity and challenge, and others to lose focus? What is it that enables one to resist temptation and remain undistracted, and another to become distracted? Determination, perseverance, commitment, and self-control, are some of the traits that come to mind. Taking a more holistic and multidimensional approach that encapsulates an array of positive psychological attributes may be appropriate. One umbrella term for such characteristics is Mental Toughness (MT), which is the primary focus of this thesis.

MT was initially identified as a characteristic associated with successful elite athletes (Loehr, 1986), and as being particularly beneficial when faced with pressure and adversity during competition (Clough, Earle & Sewell, 2002). MT has been suggested as a distinguishing factor that separated the good athletes from the great athletes (Gould, Hodge, Peterson & Petlichkoff, 1987), and is positively associated with behavioural perseverance (Gucciardi, Peeling, Ducker & Dawson, 2016). Mentally tough individuals remain undistracted from temptation (Cook, Crust, Littlewood, Nesti & Allen-Collinson, 2014), and motivated to achieve their goals irrelevant of the situation (Strycharczyk & Clough, 2015). Some conceptual confusion around the term still exists, with differences amongst various research groups' conceptualisations (discussed in Chapter Two, p. 11). There is, however, a consensus that MT benefits individuals during positively and negatively construed situations, which aids an individual to reach their goals irrelevant of prevailing circumstances (Gucciardi, Gordon & Dimmock, 2008; Hardy, Bell & Beattie, 2014).

The rise in MT research since the turn of the millennium has seen MT applied to domains outside of its origins in elite sport. MT has been associated with

positive outcomes in areas such as business (Marchant, Polman, Clough, Jackson, Levy & Nicholls, 2009) and education (Crust, Earle, Perry, Earle, Clough & Clough, 2014), as well as being a beneficial characteristic in stress and coping (Gerber et al., 2013). For example, MT is related to being higher up the business hierarchy (Marchant et al., 2009), progressing from first year of university study to second year (Crust et al., 2014), and more effective coping mechanisms (Gerber et al., 2013), which demonstrates the benefit of MT in multiple aspects of life. Correlates of MT, such as greater adherence (Levy, Polman, Clough, Marchant & Earle, 2006), behavioural perseverance (Gucciardi et al., 2016), remaining focused (Cook et al., 2014), and increased chance of intentions being met (Gucciardi, 2016), offer explanations to the reported relationships between MT and success.

More recently, researchers have explored MT in relation to physical activity and exercise, which can influence one's bodyweight[1]. Research has quantitatively examined the relationships between MT and physical activity. Gerber et al. (2012) reported a significant and positive relationship between MT and physical activity in college students. Qualitative inquiry has also been employed to research MT. Exercise leaders, and regular exercisers deemed as mentally tough by their exercise leaders, were interviewed (Crust, Swann, Allen-Collinson, Breckon & Weinberg, 2014). Mentally tough exercisers were characterised as being committed to their goals, remaining focused, and being resilient. Therefore, MT benefits those at a recreational level, as well as elite athletes.

Psychological health is an additional factor that can influence weight (Bose et al., 2009), which is significantly related to MT (Gerber et al., 2013). Seligman and Csikszentmihayli (2000) identified that psychological health encapsulates positive

[1] From this point body weight will be referred to as weight

human functioning and flourishing, and not simply the absence of illness. Positive psychological correlates, such as life satisfaction (Gerber et al., 2013) and positive affect (positive emotions and feelings), have been related to MT (Golby & Wood, 2016). MT may represent a positive indicator of mental health (Gucciardi, Hanton & Flemming, in press).

Health Related Lifestyle Factors and Weight Loss

To extend this line of enquiry regarding MT and lifestyle behaviours that can impact one's weight, investigating factors collectively that are related to MT would create a more holistic understanding of the subject. The application of MT to health-related lifestyle factors (HRLF) appears timely in the light of the current health status of the population. In the United Kingdom (UK) 66.4% of males and 57.5% of females are overweight or obese (Public Health England; PHE, 2016), which is nearly double the prevalence reported over the last three decades (World Health Organisation; WHO, 2016). Worryingly, the incidence of obesity is expected to continue to rise; 70% of individuals are predicted to be overweight or obese by 2034 (PHE, 2015a). These statistics are concerning for the present and future generations, as excess body fat increases comorbidities (WHO, 2016) and reduces life expectancy; being overweight can reduce life span by 2-4 years, and when extremely obese life expectancy can be reduced by 8-10 years (Prospective Studies Collaboration, 2009).

A healthy bodyweight has multiple benefits such as improved health related quality of life (Lasikiewicz, Myrissa, Hoyland & Lawton, 2014), physical benefits such as the reduced risk of non-communicable diseases (e.g., obesity, cardiovascular disease, and respiratory disease; WHO, 2016), and psychological benefits including enhanced self-esteem and decreased depressive symptoms (Lasikiewicz et al., 2014).

The statistics and health implications highlighted portray the need to understand the complex process of adoption and maintenance of healthy behaviours, particularly physical activity levels and dietary consumption, which are the most modifiable component of lifestyle behaviours (Cockerham, 2005). Furthermore, aspects such as psychological factors can influence one's weight (Bose, Olivan & Lafferrere, 2009). For example, stress can result in the consumption of unhealthy foods to enhance one's mood (Gibson et al., 2006). Therefore, identification of important factors that influence one's ability to lead a healthy lifestyle (e.g., be physically active, consume a healthy diet, and overcome stress) appears necessary.

Various strategies can be adopted to enhance the healthiness of an individual's lifestyle, for example, medication can reduce appetite, surgery can reduce the amount of food that one can consume, or individuals can be educated on the components of a healthy lifestyle (NHS, 2015d). Individuals can also join support clubs or commercial clubs to assist weight loss, for example Slimming World (SW) or Weight Watchers. Despite the method of losing weight, psychological factors appear to play an important role in weight loss. For example, there is widespread public knowledge on how to lead a healthy lifestyle, yet this knowledge alone is not sufficient to drive the adoption of healthy behaviours (Kelly & Barker, 2016). More effective behaviour change has been achieved by researchers who considered and addressed psychological factors in addition to lifestyle modification, as opposed to lifestyle modification alone (Shaw et al., 2005). Therefore, consideration of psychological factors that enhance one's capability to maintain commitment, and exhibit self-control, in relation to physical activity and dietary consumption appear necessary to achieve more effective behaviour change.

People living in the same environment can have different interpretations of their surroundings and perceive different barriers and facilitators to a healthy lifestyle. Individual differences were suggested to influence one's susceptibility to an unhealthy lifestyle, and ultimately influence their weight (Finlayson, Cecil, Higgs, Hill & Hetherington, 2012). Individual differences are the "relatively stable traits, characteristics, or dispositions of the individual" (e.g., age and height; Horn, 2008, p. ix). Within the discipline of psychology, individual differences incorporate factors such as motivation, esteem, or personality characteristics, and are "differences that exist between people in their subjective appraisals of the world around them and the events that occur in the world" (Horn, 2008, p. ix).

Some people manage to overcome barriers and resist physiological, economic, and environmental factors that attract them to previous unhealthy behaviours (Stubbs, Whybrow, et al., 2011), which may be due to their individual differences. For example, autonomous motivation can predict adherence to healthier behaviours to achieve weight loss (Webber, Tata, Ward & Bowling, 2010). Additional individual differences that have been reported to be important influencers of HRLF include self-efficacy (McAuley et al., 2011) and personality (Rhodes & Smith, 2006; Mottus, McNeill, Jia & Deary, 2013). MT is related to such individual differences (Clough et al., 2002; Horsburgh, Schermer, Veselka & Vernon, 2009), and thus can holistically encapsulate these psychological factors that influence one's HRLF and weight. Additionally, the potential malleability of MT (Gucciardi, Jackson, Hodge, Anthony & Brooke, 2015) makes this an appealing individual difference to explore in relation to health-related lifestyle behaviours, as opposed to factors which appear more fixed. Therefore, exploring MT in relation to HRLF could be a valuable avenue for research.

Research Aim and Objectives

The overarching aim of this thesis was to investigate MT and HRLF that can contribute to weight loss (i.e., physical activity, dietary behaviours, and psychological wellbeing). Conducting this research can enable a deeper understanding of MT and identify whether it is applicable to domains outside of those previously researched (e.g., sport, business). MT will be investigated in relation to lifestyle modifications to lose weight, which is an important topic given the aforementioned high prevalence of obese and overweight individuals. This work will also extend the current knowledge of MT, which is emerging as an important psychological characteristic in multiple domains (e.g., education, elite sport; Crust, Swann, et al., 2014; Cook et al., 2014, respectively). Thus, the current research will explore whether MT can also be beneficial within the HRLF domain. To address this overarching aim five research objectives were set; each objective is addressed in turn in the empirical studies presented in Chapters Three to Seven:

- Research objective one (Study One): Examine relationships between MT and HRLF (physical activity levels, exercise barriers, dietary behaviour, and psychological wellbeing) in a population at risk of leading an unhealthy lifestyle and weight gain (e.g., university students)
- Research objective two (Study Two): Longitudinally investigate MT and weight loss in members of a slimming club, who wish to lose weight by making lifestyle changes (i.e., change physical activity levels and dietary behaviours)
- Research objective three (Study Three): Longitudinally investigate MT and weight loss in non-members of a slimming club, who wish to

lose weight by making lifestyle changes (i.e., change physical activity levels and dietary behaviours)

- Research objective four (Study Four): Gain a further insight into factors influencing the relationship between MT and weight loss, and offer tentative explanations as to why MT and weight loss were not significantly related
- Research objective five (Study Five): Gain a deeper understanding of the role of MT in the pursuit of a weight loss goal in low mentally tough individuals, by further investigating low mentally tough individuals' attitudes, beliefs, and perceptions regarding HRLF and weight loss

Defining Key Terms

This section presents an understanding of selected terms of importance, the independent variable (MT) and dependent variables (physical activity/exercise, exercise barriers, dietary behaviours, psychological wellbeing, and weight loss), as well as placing the variables in the context of this thesis. The definition of MT has been investigated by numerous researchers (e.g., Clough et al., 2002; Thelwell, Such, Weston, Such & Greenlees, 2010). There is a general agreement that MT relates to one's ability to achieve goals irrelevant of the situations, as well as bounce back from setbacks (Strycharczyk & Clough, 2015). In the current thesis, MT is investigated in relation to HRLF that are the *processes* that influence the *outcome* of weight loss (i.e., does MT influence HRLF, which then influences weight loss?). Therefore, this thesis aims to investigate both the process and the outcome elements described, to create a more holistic understanding of MT and HRLF.

Health-related lifestyle factors is used as an overarching term that incorporates factors that influence lifestyle. Specifically, physical activity/exercise levels, dietary behaviours, and psychological wellbeing. The term *health related lifestyle behaviour* refers to the behaviour associated with a healthy lifestyle that can be adopted or maintained (i.e., physical activity/exercise, and diet). *Physical activity* is any bodily movement produced by the muscles that leads to energy expenditure (Caspersen, Powell, Christenson, 1985), and *exercise* is structured and regular (Bouchard & Shepard, 2012). Throughout this thesis physical activity and exercise are used interchangeably, as the thesis is focused on the energy expenditure of the participants irrelevant of whether the activity was achieved through structured exercise (e.g., football match or gym workout) or bodily movements for daily life (e.g., active transportation or housework). *Dietary behaviours* refer to the characteristics of an individual's eating habits (e.g., healthy eating, emotional eating). *Psychological wellbeing* represents "the achievement of one's full psychological potential" (Carr, 2004, p. 36). Seligman and Csikszentmihalyi (2000) identified psychological health as not simply the absence of illness, it also represents positive human functioning and flourishing. Thus, this thesis addresses the positive aspects of psychological health, as opposed to investigating mental illness symptoms. *Weight loss* refers to a decrease in an individual's body weight in order to reach a healthy body weight assessed via body mass index (BMI). A healthy BMI is 18.5 – 25kg/m² (NHS, 2016e).

Although there are different views of what constitutes a healthy lifestyle, throughout this thesis a healthy lifestyle is considered to represent being physically active and consuming a nutritious diet (e.g., meeting the recommended calorie intake, low saturated fat intake), which enables a healthy weight to be achieved and

maintained (NHS 2015c; Blake, Bell, Freedman, Colabianchi & Liese, 2012). Low levels of physical activity and lack of a nutritious diet (e.g., high salt and fat intake) are considered to characterise an unhealthy lifestyle (NHS 2015c; Blake et al., 2012), which can result in an unhealthy body weight.

Overview of Thesis

The thesis comprised eight chapters and five studies, which together address the overarching aim and research objectives of this thesis. Figure 1.1. presents an overview of the thesis.

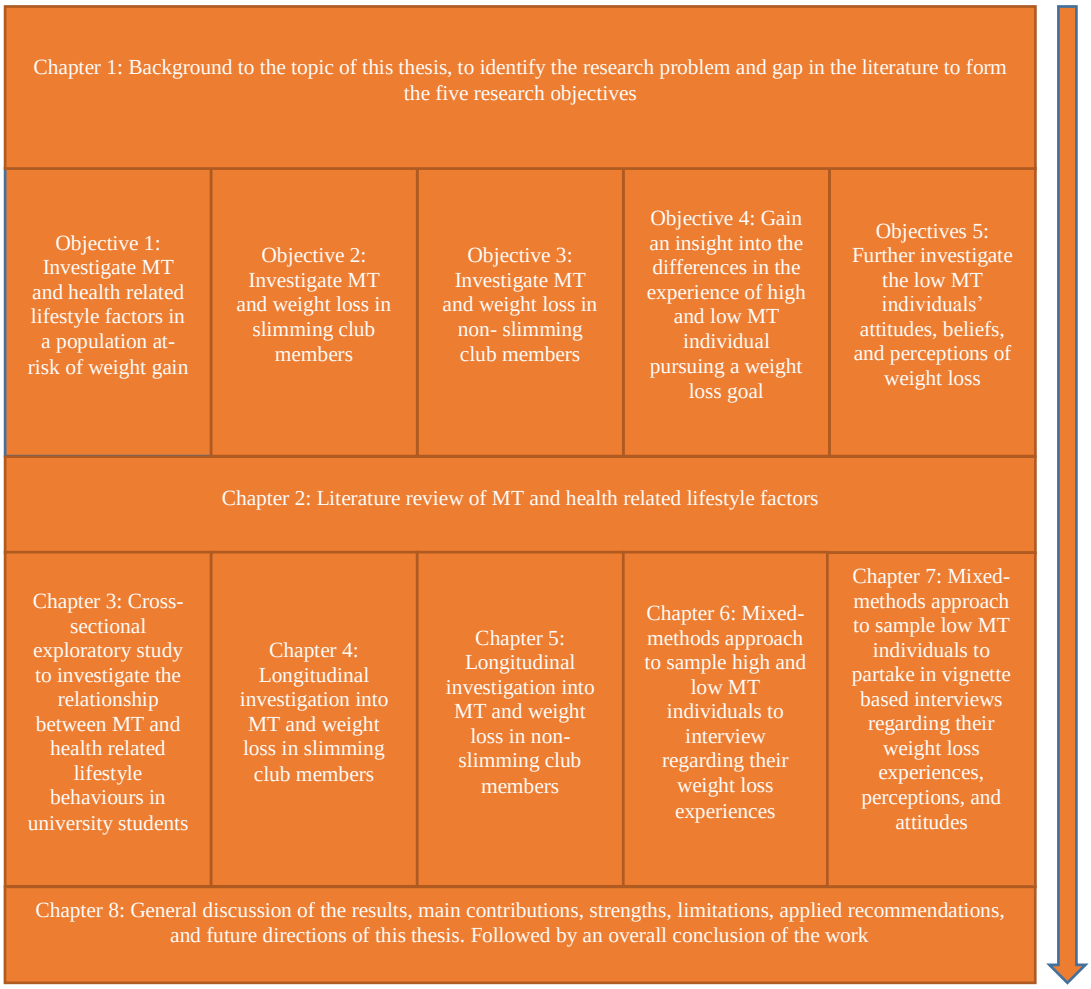

Figure 1.1. An Overview of the Thesis.

Chapter Two: Literature Review

Overview

This thesis aimed to investigate MT, and HRLF (i.e., physical activity, dietary consumption, and psychological wellbeing) and weight loss. The aim will extend the application of MT beyond elite sport by examining whether MT can contribute to addressing the high prevalence of obesity and overweight individuals. The current chapter presents a narrative review, which is split into two sections; a narrative review of the MT literature, and a narrative review of HRLF. The literature in this chapter informed the subsequent empirical studies in this thesis.

Part I: Mental Toughness

This first part of the chapter aimed to critically review the existing definitions, models, and measures, of MT, to present an up-to-date understanding of the concept. This chapter will provide: (a) a background to the theoretical underpinning and conceptualisations of MT; (b) a critique of the current definitions and models of MT, to find the most robust model that is also applicable to lifestyle; and (c) an overview of how MT can be developed, and how the construct can be measured.

Conceptualisations of Mental Toughness

For over half a century research has been conducted into MT, with a sharp rise since the turn of the millennium. Different research groups have offered various conceptualisations and each group has contributed to the current understanding of MT. This section provides a chronological overview of the key conceptualisations and concludes with the conceptualisation and model of MT adopted by this thesis.

The Origin of Mental Toughness

The earliest academic reference to MT was by Cattell (1957), who identified tough mindedness as one of the 16 primary traits assessed using the 16-personality factor instrument (16PF). Tough mindedness, the opposite of tender mindedness, was defined as being highly conscientious and open to emotions and fresh ideas while also displaying self-control. Although defined as a trait by Cattell, which has been supported by subsequent researchers (Kroll, 1967), others have reported MT as a state of mind (Gibson, 1998) or a set of psychological characteristics (Bull, Albinson & Shambrook, 1996; for an in-depth discussion see Development of Mental Toughness, p. 32). Subsequent to Cattell's work, MT emerged as being important within the sport domain; 82% of 126 intercollegiate wrestling coaches identified MT as the most important psychological characteristic in determining competitive success (Gould et al., 1987). Following the recognised importance of MT amongst athletes and coaches, numerous studies that offered a deeper understanding of MT within elite sport were instigated (e.g., Clough et al., 2002).

offered a deeper understanding of MT within elite sport were instigated.

investigations into MT (e.g., Clough et al., 2002; Loehr, 1982) that

Early research exploring MT within elite sport was conducted by Loehr (1982; 1986), who reported a mentally tough individual as having a positive attitude towards challenges, and effectively using energy during times of adversity. Loehr's work had strong face validity, however it lacked statistical support such as confirmatory factor analysis (Gucciardi, Hanton & Mallett, 2012), and lacked scientific rigor as it was not based on empirical research (Earle, 2012). Furthermore, these early investigations were atheoretical, which is the contrary to a strong model that should be grounded in pre-existing psychological theory (Earle, 2012), thus

future studies addressed this limitation (e.g., Clough et al., 2002). Loehr's early research created confusion around the concept as opposed to enhancing scientific understanding (Connaughton & Hanton, 2009; Thelwell et al., 2010).

Numerous early sport psychologists proposed a set of characteristics associated with MT as opposed to defining MT (e.g., Bull et al., 1996; Gould et al., 1987). It appeared virtually any positive psychological characteristic accompanying sporting success was labelled as MT (Coulter, Mallett & Gucciardi, 2010). Common characteristics relating to MT that emerged from these early investigations included: self-belief (e.g., Goldberg., 1998); persistency and refusal to quit (e.g., Bull et al., 1996); remaining motivated (e.g., Gould et al., 1987); withstanding criticism (e.g., Alderman, 1974); and coping with adversity (e.g., Williams, 1988). The initial MT definitions were accompanied by the same limitations as Loehr (1982), and prompted rigorous scientific investigations to explore and develop the knowledge of the emerging concept, as opposed to the previous anecdotal based research. Subsequent rigorous studies enabled the production of more valid and reliable methods of assessing MT (e.g., Clough et al., 2002; Hardy et al., 2013). It transpired that the contemporary MT research produced similar characteristics of MT compared to the earlier research (see Table 2.1). Therefore, despite their methodological limitations (e.g., based on anecdotal evidence) the earlier definitions are not that dissimilar from the recent definitions proposed by more robust methods, as discussed below.

Fourie and Potgieter (2001) were amongst the first researchers to use more rigorous methods, and conducted a qualitative study to identify the reported key components of MT. A sample of 131 expert coaches and 160 elite athletes, from 31 sports, identified 12 key components of MT. Fourie and Potgieter reported

concentration to be the most important characteristic according to the coaches, while perseverance was most important to athletes. These findings conflicted with succeeding studies that reported self-belief as the most important characteristic of MT (e.g. Gucciardi et al., 2008; Jones, Hanton & Connaughton, 2002; Thelwell, Weston & Greenlees, 2005). The differences in findings may be due to methodological limitations, for example the open-ended written response questions eliminated the opportunity to probe or explore the participants' thoughts, thus restricting the richness and quality of the data. Subsequent work offered qualitative research methods, such as interviews and focus groups, which could overcome these limitations due to the opportunity to probe participants to gain richer information (Sparkes & Smith, 2014).

Post-2002 Work

After the turn of the millennium there was a notable rise in the attention MT research received. Multiple research groups (e.g., Clough et al., 2002; Jones et al., 2002) offered conceptualisations that progressed the understanding of MT. The predominant research groups' work is chronologically presented below.

Clough, Earle, and Sewell (2002) – 4 C's models of mental toughness.

Clough et al. (2002) reported receiving numerous requests from athletes and coaches to enhance MT, which prompted their vast investigations into this concept. They conducted 12 in-depth interviews with eight athletes, three coaches, and one chief executive, from a range of sports (e.g., golf, squash, and rugby) to explore MT. Emerging themes were similar to the psychological construct of hardiness, a personality trait which acts as a buffer between life stressors and an individual's perception and reaction to the stressor (Kobasa, 1979). The foundation of hardiness consists of the 3 C's:

Table 2.1

The Commonly Reported Characteristics of Mental Toughness

Researchers:	**Jones et al. (2002)**	**Jones et al. (2007)**	**Clough et al. (2002)**	**Bull et al. (2005)**	**Thelwell et al. (2005)**	**Gucciardi et al. (2008)**	**Coulter et al. (2010)**
Number of attributes:	12 attributes	30 attributes	Four components, four subcomponents	20 global themes	10 attributes	11 key characteristics	14 characteristics
Sample:	10 elite athletes	Five male, three female super elite athletes and psychologist and coaches	Eight athletes, three sport coaches and one sport chief executive – all working at the professional or elite level	12 elite male cricketers	43 male soccer players	11 male Australian football coaches	Six male Australian soccer players and their parents and coaches
			Self-belief				
	Unshakable self-belief in your ability to achieve your competition goals	Belief that you can push through any obstacle people put in your way	High sense of self belief	Robust self confidence	Having total self-belief at all times that you will achieve success	Self-belief	self-belief
			Coping				
	Accepting that competition anxiety is inevitable and knowing that you can cope with it	Adapting to and coping with any change/distraction/threat under pressure	Remain calm and relaxed	Keeping perspective	Having the ability to hang on and be calm under pressure	Handling pressure	Coping under pressure
			Focused				
	Remaining fully-focused in the face of personal life distractions	Totally focusing on the job at hand in the face of distraction		Maintain self-focus	Having the ability to ignore distractions and remain focused	Concentration and focus	Concentration and focus

Committed/determined						
	Total commitment to your performance until every possible opportunity of success has passed	Commitment	'Go the extra mile' mind set	Knowing what it takes to grind yourself out of trouble	Determination	Work ethic
Resilience						
Bouncing back from performance setbacks	Not being fazed by making mistakes and then coming back from them	Remain relatively unaffected by competition or adversity	Resilient confidence	Having the ability to react to situations positively	Resilience	Resilience
Motivated						
Having an insatiable desire and internalized motives to succeed	Using long term goals as a source of motivation				Self-motivated	Winning mentality and desire
Thriving on pressure						
Thriving on pressure of competition			Enjoying the pressure associated with performance			
Control						
	Remaining in control and not controlled	Unshakable faith that they control their own destiny		Controlling emotions throughout performance		

control (the belief that they can control or influence the events of their experience); commitment (an ability to feel deeply involved in or committed to the activities of their lives); and challenge (the anticipation of change as an exciting challenge to further development). In addition to components similar to those of hardiness, Clough et al. identified confidence as a key component of MT. Based on the findings from the interviews Clough and colleagues formed the 4 C's Model of MT, which comprised of; challenge, commitment, control, and confidence. The latter two components were split into subcomponents; control was divided into life control and emotional control, and confidence was divided into confidence in abilities and interpersonal confidence (see Table 2.2 for component descriptions). Clough et al. concluded:

> Mentally tough individuals tend to be sociable and outgoing; as they are able to remain calm and relaxed, they are competitive in many situations and have lower anxiety levels than others. With a high sense of self-belief and an unshakeable faith that they control their own destiny, these individuals can remain relatively unaffected by competition or adversity. (2002, p. 38)

The theoretical underpinning of hardiness, in combination with an applied perspective, provided a strong basis for the 4 C's Model (Earle, 2012). Similarities between hardiness and MT are acknowledged, such as coping under pressure and remaining focused during uncertainty (Clough et al., 2002), however key factors distinguish between the two concepts. The 4 C's model captured the importance of both interpersonal confidence and confidence in abilities, which was mentioned by all interviewees (Clough et al., 2002); confidence and self-belief continue to be acknowledged as the most important attribute of MT (e.g. Jones et al., 2002; Jones et al., 2007). Confidence however, does not feature within the theory of hardiness. An

Table 2.2

The Components in the 4C's Model of Mental Toughness (Clough et al., 2002), Descriptions from Clough & Strycharczyk (2012) and Strycharczyk & Clough (2014)

Component	Sub-component	Description	High scorers	Low scorers
Challenge	N/A	The extent to which an individual will see a challenge as an opportunity	Like challenge; provoke change; like problem solving	Don't like sudden changes; fear of failure; avoid risk
Commitment	N/A	The extent an individual is likely to persist with a task or goals	Break things/goals into manageable chunks; maintain focus; accept responsibility	Easily distracted; intimidated by goals; unwilling to make an effort
Confidence	In abilities	The extent that an intellectual toolkit is possessed (e.g., skills, knowledge) to attempt, or to complete a task	Believe they are a worthwhile person; less dependent on external validation; optimistic	Low self-belief; inhibited by competence or excellence in others; may under-estimate own capabilities
	Interpersonal	The extent one is prepared to exert them self, and preparedness to deal with challenge or ridicule	Easily engage in group activities; happy to ask for help; not easily embarrassed	Easily intimidated; won't ask questions; seek to avoid making mistakes
Control	Life	The extent one believes they shape what happens to them	Believe they can make a difference; good at prioritising; handle multiple tasks	Readily find excuses; struggle to multi task; believe things happen to them
	Emotional	The extent that one control anxieties and emotions	Stay calm in a crisis; do not appear anxious; difficult to provoke or annoy	Show emotions when provoked; adopt a fatalist approach; anxious

additional distinguishing factor is that hardy individuals cope with challenges they encounter, whereas mentally tough individuals will seek challenges and even thrive from competition. Further differences lie within the control component that appears in the two psychological theories, the control component of both hardiness and MT refers to control over life events. The 4 C's model however, incorporates an element of emotional control and keeping emotions in check.

Clough and colleagues (2002) were the first to combine robust psychological theory (i.e. hardiness) with applied practice in sport, which creates a strong foundation for the 4 C's model of MT (Earle, 2012). The 4C's model is one of the most widely cited models of MT, and it has been applied to multiple domains, for example sport (Clough et al., 2002), education (Crust, Earle, et al., 2014), and business (Marchant et al., 2009). MT may have been applicable to these domains due to some similarities they share with sport, for example high pressured situations, competitive environments, performance being measurable, and challenges. Furthermore, components such as interpersonal confidence enhance the generalisability, and support the wide usage of the model (Crust & Swann, 2011). The model displays high content validity with other psychological characteristics, such as self-esteem, optimism, and coping (Clough et al., 2002). Taken together, these factors make the 4 C's model appealing to researchers, particularly when applying MT to various domains.

Jones, Hanton, and Connaughton (2002) - framework of mental toughness. Concurrent to the development of the 4C's model, Jones et al. (2002) adopted a rigorous methodology guided by Personal Construct Psychology (PCP; Kelly, 1995). Originating from personality and cognitive research, PCP is a guiding framework that incorporates the uniqueness of an individual and their perceptions of

the world. Jones et al. investigated 10 elite athletes from a variety of sports (e.g. golf, triathlon, netball) in a three-stage protocol: (a) a focus group with three of the 10 elite athletes who defined and identified key characteristics of MT based on themselves, or others they viewed as mentally tough; (b) semi-structured interviews with the remaining seven participants to identify whether they agreed with the definition and attributes; and (c) verification of the definition and order of ranked attributes identified in stages one and two with all the participants. Jones et al. (2002) reported 12 ranked attributes of MT (Table 2.3). They concluded:

> MT is having the natural or developed psychological edge that enables you to:
>
> - Generally, cope better than your opponents with the many demands (competition, training, and lifestyle) that sport places on a performer.
> - Specifically, be more consistent and better than your opponents in remaining determined, focused, confident and in control under pressure. (2002, p 209)

Subsequently, Jones, Hanton & Connaughton (2007) supported their earlier definition (Jones et al., 2002) and created a framework of MT (Figure 2.1). The data triangulation in the later study (i.e., *super elite athletes* [recognised as the best in the world], sport psychologists, and sport coaches) captured multiple viewpoints of MT (Braun & Clarke, 2013). Jones et al., (2007) gained a deeper understanding and extended their earlier reported 12 attributes of MT (Jones et al., 2002) to 30, and created four sport specific dimensions forming the foundations of their MT framework: *attitude/mind set* (the athletes' belief and focus); *training* (using long term goals for motivation and pushing to the limit); *competition* (handling pressure, staying focused and maintaining belief); and *post-competition* (handling success and

failure). The framework highlights the importance of MT within competition as well as less pressured events, such as training and post competition, displaying the potential application of MT to everyday less pressured environments.

Table 2.3.

Jones et al. (2002) 12 Ranked Attributes of Mental Toughness derived from sports

Rank	Attribute
1	Having an unshakable self-belief in your ability to achieve your competition goals
2	Bouncing back from performance setbacks as a result of increased determination to succeed
3	Having an unshakable self-belief that you possess unique qualities and abilities
= 4	Having an insatiable desire and internalised motives to succeed
= 4	Remaining fully-focused on the task at hand in the face of competition specific distractions
6	Regaining psychological control following unexpected, uncontrollable events (competition-specific)
7	Pushing back the boundaries of physical and emotional pain, while still maintaining technique and effort under distress (in training and competition)
8	Accepting that competition anxiety is inevitable and knowing that you can cope with it
= 9	Thriving on the pressure of competition
= 9	Not being adversely affected by others' good and bad performances
11	Remaining fully-focused in the face of personal life distractions
12	Switching a sport focus on and off as required

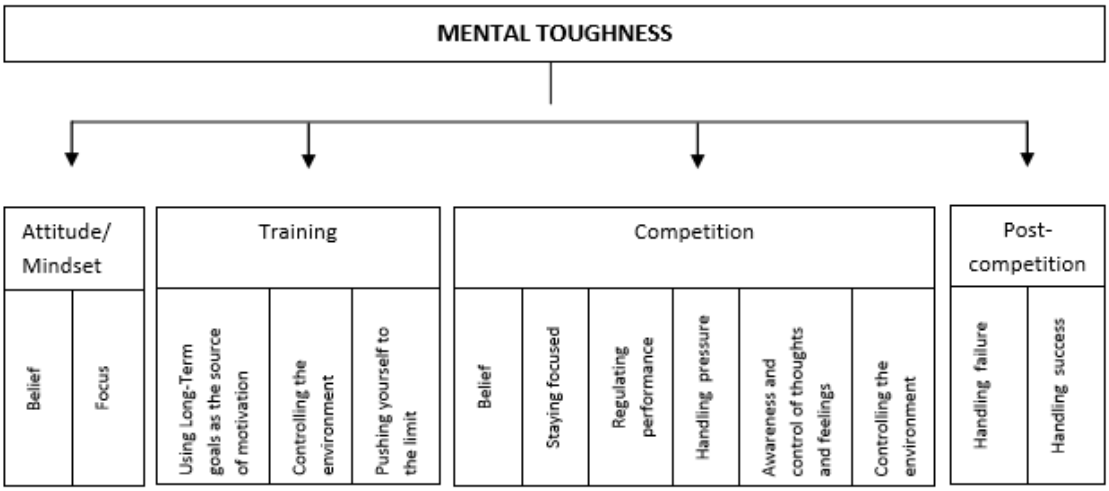

Figure 2.1. Jones et al.'s (2002) Framework of Mental Toughness.

Andersen (2011) highlighted concerns regarding Jones et al.'s (2002) inclusion of an individual's MT being influenced by an opponent's behaviour (e.g., being better than your opponents). The reference to a weaker opponent was considered to create confusion. The athlete may cope effectively and better than their opponent one day, however the next day when against a stronger opponent the athlete's coping may be inferior to their challenger, and thus the individual is deemed as not coping as effectively. The individual's coping may have been consistent, one of the many criteria of MT, however it is the level of the opponent's ability that changed. The failure may falsely indicate MT has decreased, which does not seem likely considering MT has been proposed as trait-like (Hardy et al., 2013) and relatively stable (Hardy et al., 2013; Strycharczyk & Clough, 2014); MT requires a period of time, not a day, to develop (Bull, Shambrook, James & Brooks, 2005). Alternative definitions avoided reference to others, and instead referred to an individual achieving their personal goals (e.g., Coulter et al, 2010; Hardy et al., 2013).

Gucciardi, Gordon, and Dimmock (2008) - model of mental toughness in Australian football. Gucciardi et al. (2008) identified what MT was not, and the characteristics of low mentally tough individuals. Interviews with Australian football coaches provided 30 general and competition specific attributes of MT (e.g., self-ethic, work ethic). Their interpretation was more theoretically aligned to PCP than Jones et al. (2002), which enabled the opposites of MT attributes to be captured (e.g. work ethic versus being lazy; perseverance versus always giving up). The attributes were categorised into: characteristics; behaviours; and situations (Figure 2.2), which formed the components of their model of MT. They concluded MT in Australian footballers was:

> A collection of values, attitudes, behaviours, and emotions that enable you to persevere and overcome any obstacle, adversity, or pressure experience, but also to maintain concentration and motivation when things are going well to consistently achieve your goals. (Gucciardi et al., 2008, p. 278)

Gucciardi et al., (2008) progressed research that described the outcome of being mentally tough (e.g., overcoming challenges, remaining level headed; Clough et al., 2002), to identifying the psychological characteristics of what MT actually is, and the qualities that enable the individual to be successful. For example, MT is when an individual possesses a collection of values that enables behaviours such as achieving goals (Gucciardi et al., 2008), or positive appraisal of a situation (Coulter et al., 2010). The enhanced understanding of MT progressed the knowledge of this tough behaviour, and enable achievement or success.

Gucciardi et al. (2008) was amongst the first researchers to highlight the importance of MT in positively construed situations, in addition to the previously reported benefit of MT during negatively construed situations (e.g., Clough et al., 2002). This

would appear logical as MT cannot simply disappear once adversity or pressure is absent (Andersen, 2011). It is these finite differences which sets MT apart from other similar constructs such as resilience. Resilience and MT involves coping with pressure and bouncing back following setbacks, however, MT includes the additional element of thriving and being successful during the pressurised and challenging situations (Clough, 2016). The importance of MT in positively construed situations and thriving was supported by later researchers (e.g., Mahoney, Ntoumanis, Mallett & Gucciardi, 2014).

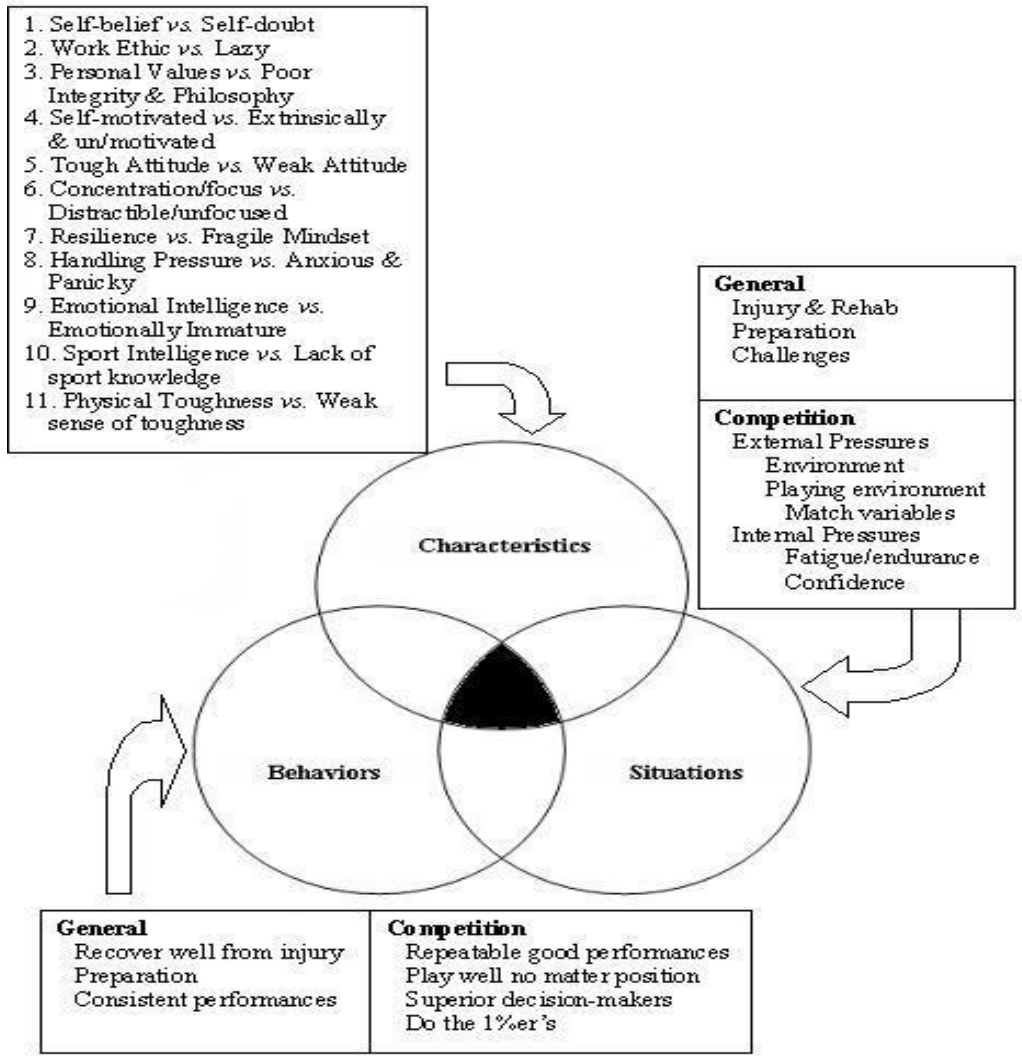

Figure 2.2. Gucciardi et al. (2008) Model of Mental Toughness in Australian Footballers

Gucciardi and colleagues reported the opposite of MT was m*ental weakness*, the term weakness can be associated with negative connotations implying it is an inferior and undesirable characteristic. Clough and Strycharczyk (2012) named the opposite of MT as *mental sensitivity*, a term which appears less associated with negative connotations, which is similar to the earlier work of Cattell (1957). Furthermore, weakness infers the individual may frequently break down, whereas being sensitive implies being more emotionally sensitive to a given situation. The term mental sensitivity is in line with Cattell's (1957) early research which reported tender mindedness as the opposite to tough mindedness. Clough and Strycharczyk highlighted the importance of a balanced society, which requires a combination of both mentally tough and mentally sensitive individuals, and high MT should not be assumed to always be the ideal (see Drawback of Mental Toughness section in this chapter, p. 27).

Mahoney, Ntoumanis, Mallett, and Gucciardi (2014) – mental toughness conceptualisation. Commensurate with Gucciardi et al. (2008), Ntoumanis an colleagues (2014) also progressed the understanding of what being MT enables one to do. Mahoney, Ntoumanis, et al. presented a tripartite conceptualisation of MT (Striving, surviving, thriving; Figure 2.3). In contrast to the earlier work which suggested a list of attributes an individual must have to be classified as mentally tough, Mahoney, Ntoumanis, et al. suggested that a combination of some of the attributes enables an individual to survive, strive, and thrive, all of which

encapsulates mentally tough behaviour. Therefore, an individual does not need to possess *all* characteristics of MT.

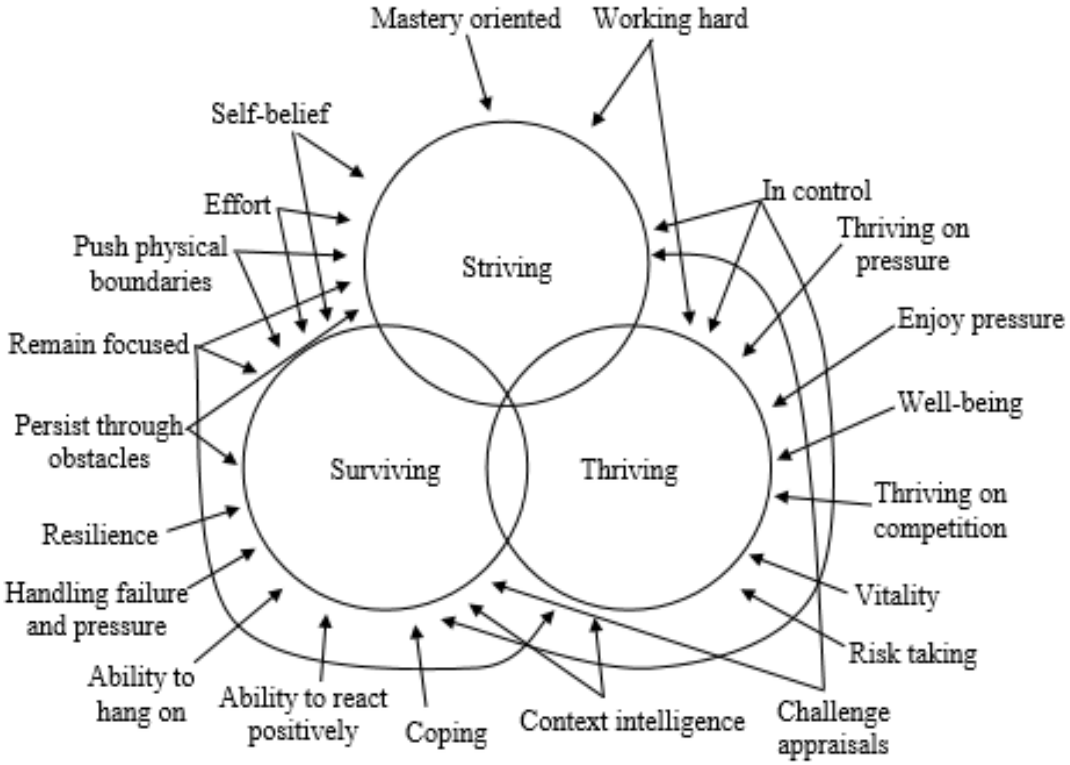

Figure 2.3. Mahoney, Ntoumanis, et al.'s (2014) Conceptualisation of Mental Toughness.

Note. Characteristics around the edge are previously reported MT attributes, which feed into Mahoney, Ntoumanis, et al. (2014) three components.

Mahoney, Ntoumanis, et al. (2014) work supports Clough and colleagues' 4C's model, demonstrated through similarities between the foundations of the two models; *striving*, which is characterised as the effort an individual invests into achieving a goal is similar to the component of *commitment* regarded as having the ability to consistently work hard, remain focused, and break goals down into achievable chunks. *Surviving*, comprised of being able to bounce back from failure and handle pressure is similar to *control*, which involves the individual taking control of their choices and keeping emotions in check when under pressure.

Thriving, which is related to a sense of learning through daily life and being energised to achieve the task is similar to having *confidence in abilities*, which involves identifying ways to learn and develop skills to overcome challenges. Striving, thriving and surviving appear consistent with a large amount of already reported findings. The low ecological validity, due to a lack of applied practice informing the foundations of their work, creates a limitation of Mahoney, Ntoumanis, et al.'s conceptualisation (c.f. Clough et al., 2002).

General Mental Toughness Considerations

Contributions from predominant research groups have been presented. There are some general concerns over the conceptualisation of MT, which are not specific to an isolated research group but instead applicable to a number of MT conceptualisations and definitions. Considerations such as participant selection, the drawbacks of MT, and the language in the definitions are discussed below.

Participant selection. Success has formed the bases of a number of research groups' participant selection when investigating MT (e.g., Crust, Nesti & Bond, 2010; Thelwell et al., 2010), however, being successful cannot be assumed to imply MT. For example, an individual may have strong physical skills that result in success, or may not encounter challenges that require MT to aid coping. On the other hand, athletes who are not successful or elite cannot be assumed to require MT. Some people may select to compete at a lower level due to other priorities, lack of time, or focusing on other goals in their life. Selecting participants based on mentally tough behaviours may be more appropriate (i.e. coping during negative and positive situations, or bouncing back after adversity), as opposed to purely success.

Bull et al.'s (2005) participant selection process removed the focus from success, and asked cricket coaches to identify cricketers who they believed to be

mentally tough. It still remains questionable as to whether the cricketers were identified as mentally tough due to their achievements, because cricket coaches and not trained psychologists selected the participants. Within an exercise setting, Crust, Swann, et al. (2014) used a sampling method that consisted of exercise class leaders identifying exercisers who they believed to epitomise MT, which moved away from using success as a criterion for selecting mentally tough participants. To improve participant selection criteria alternative sampling methods may be beneficial, for example psychometric measures. Therefore, researchers may avoid this assumption that success implies MT, by selecting participants based on quantitative assessments rather than their success.

Furthermore, the majority of MT research has focused on sampling participants with high MT (e.g., Cook et al., 2014; Crust, Swann, et al., 2014). Low mentally tough individuals have received limited research attention, and require further investigation to explore their characteristics and how they can be assisted, or their MT can be enhanced. This appears particularly important considering low MT individuals have been reported to possess undesirable characteristics (e.g., "being lazy"; Gucciardi et al., 2008). Therefore, the experiences and characteristics of low MT individuals should be included in future work investigating MT.

Unrealistic criteria. The majority of early MT research provided a set of unrealistic criteria to epitomise MT, for example "overcome any obstacle"; "be more consistent"; or "always cope better" (Gucciardi et al., 2008, p. 278; Jones et al., 2002, p. 209; Thelwell et al., 2005, p. 328, respectively). The unrealistic criteria are potentially attributable to methodological issues. Numerous early researchers took a composite approach and requested athletes and coaches to describe the ideal mentally tough performer (Jones et al., 2002; Thelwell et al., 2005). This protocol

can result in the best attributes of an athlete being cherry picked (e.g., coping with pressure, or beating an opponent), and the negative characteristics disregarded (e.g., becoming stressed, losing to the opposition, frustration and anger), to create an unobtainable set of characteristics. More recent researchers (e.g. Andersen, 2011; Caddick & Ryall, 2012) have critiqued this approach due to the set of unrealistic and unattainable criteria produced, which was termed *absolute fantasy language* (Andersen, 2011). The absolute fantasy language also promotes the potential for an unhealthy environment (Coulter, Mallet, & Singer, 2016), as people are trying to reach unobtainable criteria.

Recent work has moved towards gaining first-hand accounts from participants, for example discussing their experiences of exercise or mountain climbing (e.g., Crust, Swann, Allen-Collinson, 2016; Crust, Swann et al., 2014). This can capture the positive and negative experiences, as opposed to selecting the most positive aspects and characteristics. Future researchers may adopt this approach to offer a more *realistic* understanding of a mentally tough individual, as opposed to the *ideal* mentally tough individual.

Drawbacks of mental toughness. MT appears desirable and beneficial for a range of reasons, such as assisting the individual to cope more effectively with pressurised and challenging situations (Clough et al., 2002). Recent research, however, has identified the *dark side* of MT (e.g., Crust, Swann, et al., 2014). Exercisers with high MT can be overcommitted to training and continue to exercise when injured, which presents risk of further injury (Crust, Swann, et al., 2014). Similarly, mentally tough athletes were less compliant during sports rehabilitation, potentially due to their lower perception of the severity of their injury, which may inhibit their recovery (Levy et al., 2006). Therefore, it appears an extremely high MT

is not always desirable; however, an optimal level of MT may be beneficial and provide the individual with the resources to cope and make suitable decisions in pressurised situations.

Sporting environments that support slogans such as ‘no pain no gain’ have been associated with a mentally tough culture that can have a negative impact. The absolute fantasy language and unrealistic descriptions of MT may provide a false impression of what MT is, which potentially promotes training to the point of injury as opposed to safe training environments (Coulter et al., 2016; Tibbert, Andersen & Morris, 2015). Furthermore, Owusu-Sekyere and Gervis (2013) reported some MT cultures approach promoting emotional abuse to the athletes, and appears to have little consideration of an individual’s psychological wellbeing. One aim of this thesis is to explore the relationship between MT and psychological wellbeing. Later definitions shifted from absolute fantasy language and presented more relative and realistic criteria (e.g. Bell, Hardy & Beattie, 2013; Clough & Strycharczyk, 2012; Hardy et al., 2013).

Summary of Conceptualisations of Mental Toughness

Over the last two decades the research regarding MT has attempted to progress and expand the understanding of this concept; however, the rise in MT research created conceptual confusion (Connaughton, Hanton & Jones, 2010). Uncertainties still exist regarding this elusive phenomenon and a lot remains to be learnt (Gucciardi, 2017). The conceptualisations presented demonstrate the progression in the MT literature, and that each of the researchers added a valuable contribution to the understanding of the concept. For example, incorporating realistic criteria of MT as opposed to using *absolute fantasy language*. The 4C’s model appears most applicable to the focus of this thesis as it is generalisable to multiple

domains, as opposed to exclusively sport like most of the alternative conceptualisations of MT (e.g., Jones et al., 2002). Furthermore, the model appears to capture the majority of the reported characteristics of MT, as demonstrated in Figure 2.4.

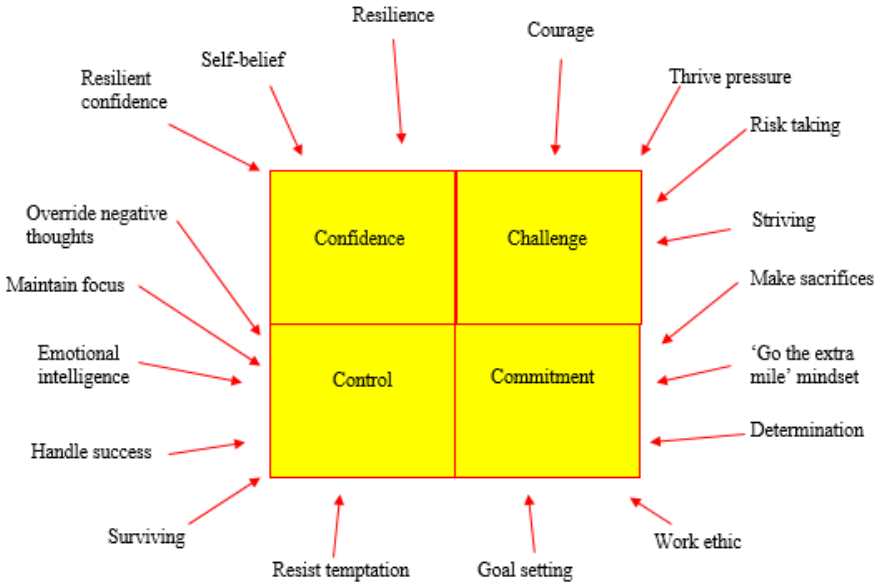

Figure 2.4. Similarities between Different Research Groups Identified Attributes of Mental Toughness in relation to the 4 C's Model of Mental Toughness

Note. Characteristics from: Bull et al., 2005; Jones et al., 2002; Gucciardi et al., 2008; Mahoney, Ntoumanis, et al., 2014; Thelwell et al., 2005; Coulter et al., 2010; Cook et al., 2014

Development of Mental Toughness

One reason for investigating MT was the frequent request to increase it (e.g., Clough et al., 2002). Therefore, an understanding of the potential malleability and ways to enhance MT were sought. Additionally, this thesis aims to investigate MT and HRLF and weight loss, if MT does play a role in these variables this reinforces the importance of future researchers to understand ways to modify MT. There has been an ongoing debate regarding whether MT is a psychological trait (Strycharczyk & Clough et al., 2014), a state of mind (Gucciardi, Hanton, Gordon, Mallett, & Temby, 2015), or a set of psychological characteristics (Bull et al., 1996) - with the

first two being the most debated. An overview of the role of nature and nurture in MT development is presented below.

Nature

Behavioural genetic studies have explored the extent to which environmental and genetic factors contribute to differences in behaviour traits (Horsburgh et al., 2008). Horsburgh et al. (2008) conducted a behavioural genetic study to investigate the relationship between MT and the Five Factor Model of personality (FFM; Costa & McCrae, 1992). The five factors in the FFM are: (a) Extraversion (being sociable and assertive as opposed to withdrawn and unadventurous); (b) Neuroticism (being anxious, self-conscious and emotional as opposed to relaxed and imperturbable; (c) Conscientiousness (having self-discipline, independence, and achievement to strive for as opposed to being careless and inconsistent; (d) Openness (being imaginative and welcoming of new experience as opposed to uncreative; and (e) Agreeableness (being cooperative and kind as opposed to selfish and rude). Horsburgh et al.'s study involved 438 twins (152 monozygotic and 67 dizygotic pairs of twins), the twin based research enabled the genetic basis of MT to be explored. All components of MT were significantly and positively related to extraversion and conscientiousness, and significantly and negatively related to neuroticism. All components of MT, except life control, were significantly and positively related to openness to experiences. Similarly, all MT components, except emotional control, were significantly and positively related to agreeableness. Extroversion, being significantly and positively correlated with MT reflects Clough et al. (2002) definition that states mentally tough individuals are 'sociable and outgoing'. Challenge and confidence were reported to display the greatest genetic basis, and control and commitment displayed the weakest. This suggests the latter two

components are the most modifiable, thus may be the easiest to target through environmental influences or targeted interventions.

Golby and Sheard (2006) explored the genetic role in MT development in adolescent swimmers. Specifically, they explored MT in relation to the L allele gene, which is associated with protection against trauma (Hariri et al., 2002). The L allele was not significantly related to MT. Participants may have experienced situations that can build MT, such as competing abroad or family issues (Thelwell et al., 2010), thus the athletes may have been born with a level of inherited MT that was subsequently modified throughout upbringing. This highlights the complexity of differentiating between the effects of nature and nurture on MT. Furthermore, Golby and Sheard used the Psychological Performance Inventory (PPI; Loehr, 1986) to assess MT, which may have influenced their findings due to the lack of reported validity and reliability of the instrument (Gucciardi et al., 2012; See Methods to Investigate Mental Toughness, p. 38 for a further discussion on the measurement of MT).

Similarly, Clough et al.'s (2010) work demonstrated the complexity of separating nature and nurture. Clough et al. reported significant and positive correlations between MT and grey matter density in the brain. Grey matter is associated with a high level of competence when dealing with numerous stimuli, as well as being responsible for an individual's coping and efficacy – which are correlates of MT (Clough et al., 2002; Nicholls, Polman, Levy & Backhouse, 2008). Therefore Newton et al. appeared to support the biological basis of MT, however, the researchers do not discount the role of environmental factors as grey matter volume can be affected by psychosocial factors (Walsh et al., 2014). The grey matter density

an individual inherits will create varying initial levels of MT, subsequently the grey matter can alter throughout adolescence years due to environmental influences.

Nurture

The role of nurture in MT development has received considerable attention. MT development is a long-term process that begins in childhood (Bull et al., 2005) and requires maintenance of previously developed levels (Connaughton et al., 2010). As well as an individual's environment, targeted intervention programmes can also increase MT (Golby & Wood, 2016). The contemporary view is that MT can be *taught* (e.g., through strategies such as psychological skills training; PST) and *caught* (e.g., through experiential learning; Weinberg, Butt & Culp, 2011).

Mental toughness can be caught. Social influences can develop an individual's MT, for example through parental influences (Bull et al., 2005), sibling rivalry, and team mate encouragement and rivalries (Thelwell et al., 2010). Bull et al. (2005) suggested that the main underlying foundation of MT development was environmental influences, which was viewed as the base of their pyramid of MT. Subsequent work supported the importance of environmental influences in MT development, such as upbringing and life events (Thelwell et al., 2005). For example, gymnasts reported that competing in different environments, having good and bad performances, and attending training camps all contributed to MT development (Thelwell et al., 2010). Furthermore, environmental factors such as lack of employment and loss of a parent were reported to instil attitudes representative of being mentally tough, such as hard work ethic and independence (Fullerton, Crust & Thomas, 2010). A combination of both positive and negative events appears to foster MT development; however, individuals may not experience many difficulties and

setbacks, or positive opportunities. Therefore, one may need to be intentionally exposed to MT promoting situations through artificial stimulation.

Mental toughness can be taught. One way to ensure individuals are exposed to challenges and positive opportunities that are associated with MT development is by manipulating the environment. For example, Bell et al. (2013) created opportunities for cricketers to practice dealing with pressure and threat. Threats were a result of punishment-conditioned stimuli; the players were told that if expectations (e.g., unclean kit) or performance standards (e.g., during testing) were not met, a negative (but relevant where possible) consequence would be provided (e.g., cleaning changing room). Significant increases in the interventions group's MT and cricket skills were observed. The punishments may have developed the threat detection skills, which Hardy et al. (2013) reported as a characteristic of high MT. The ethics of creating such environments are questionable as they may be perceived as emotional abuse and promoting a 'masculine image', which can have negative implications on athletes as previously discussed (Coulter et al., 2016; Owusu-Sekyere & Gervis, 2013; Tibbert et al., 2015).

On the contrary, positive and reward orientated environments have been reported to develop MT. An autonomous environment characterised by the individual making their own choices facilitated MT development (Mahoney, Ntoumanis, Gucciardi, Mallett & Stebbings, 2014). A distinctive element of Mahoney, Ntoumanis, et al.'s (2014) work was the incorporation of MT being diminished by the individual being exposed to a controlling environment. Furthermore, a task-involving climate that focused on mastering tasks by coaches rewarding improvements and effort was significantly and positively associated with MT (Nicholls, Morley & Perry, 2016). Although not directly associated with MT,

Nicholls et al. reported supportive coach behaviours to be significantly and positively correlated with task involving climate, displaying an indirect relationship between the coach's behaviour and the athlete's MT. This relationship highlighted the importance others can have on MT development.

PST is an effective way of enhancing MT, for example thought stopping and thought control skills (Golby & Wood, 2016). Enhancing self-awareness techniques, self-monitoring techniques, and self-regulation techniques were processes that enhanced MT amongst Australian football players (Gucciardi, Gordon & Dimmock, 2008). Additionally, Crust and Clough (2011) reported reflections on failure should be encouraged, and offered strategies to develop each of the components of the 4 C's model through PST. Bull et al., (2005) highlighted the most effective development of MT was through PST alongside environmental influences, to maximise the potential of MT interventions.

Gucciardi et al. (2015) investigated *implicit theories* (Dweck & Leggett, 1988), more recently identified as mindsets (Dweck, 2006), towards MT. Out of 1069 participants 64% endorsed an *incremental theory* of MT (i.e., believe that MT is malleable and not fixed) and 36% endorsed an *ambivalent theory of MT* (i.e., believe that some parts of MT are changeable and some parts are fixed). Whilst most participants believed that MT was open to development, some viewed only a number of the aspects of MT as modifiable. Potentially, the ambivalent group believed certain parts of the complex multidimensionality of MT (Connaughton et al., 2010) were viewed as changeable, and other parts immutable. Alongside MT development, it may be beneficial to target an individual's beliefs on the malleability of MT.

Summary of the Development of Mental Toughness

On reflection of the evidence regarding the development of MT, basing MT on either nature or nurture is insufficient due to the complex interactions that occur within developmental processes (individuals and environment etc.), and both factors are understood to influence personality and behaviour development (Sheard, 2010). A contemporary view of MT is that it is a function of situation demands or stressors, and personality attributes (Gucciardi & Hanton, 2016). MT has recently been identified as a *plastic personality trait* (Strycharczyk & Clough, 2014), which means MT is a relatively stable trait with the potential to be modified. Therefore, it is generally agreed that nature and nurture play a role in MT development, which demonstrates the potential to modify levels of MT. It is an aim of this thesis to monitor levels of MT over a period of time, and inform future interventions that aim to develop MT.

Methods to Investigate Mental Toughness

The majority of early published research on MT was qualitative, consisting of interviews or focus groups with individuals who were successful and believed to possess high levels of MT (e.g., Jones et al., 2002). Qualitative methods have provided a rich descriptive insight of MT. Investigating MT quantitatively can track changes in MT over time (Gucciardi et al., 2015), explore correlates of MT (e.g., Gerber et al., 2012), and examine factors such as behaviour and cognitive variances in differing levels of MT (Crust, 2008). The remainder of this section provides an overview of methods employed to investigate MT.

Qualitative Methods

MT has been qualitatively explored by methods such as interviews (e.g., Crust et al., 2016), and focus groups (Jones et al., 2002). The qualitative methods have focused on exploring the experiences of mentally tough individuals (e.g., Crust, Swann, et al., 2014), or gaining a perspective of mentally tough individuals from their coaches or psychologists. Focus groups can be a useful method for exploring a new concept (Braun & Clarke, 2013), thus were implemented by researchers to explore the emerging concept of MT (e.g., Jones et al., 2002). Conducting interviews has been the most commonly used method to collect qualitative data on MT (e.g., Cook et al., 2014; Crust, Swann et al., 2014), which if done properly enables one to describe experiences and perceptions in rich and detailed ways (Smith & Sparkes, 2016). Interviews can be conducted in a number of ways: structured, semi-structured, and unstructured. Semi-structured interviews were most commonly used to investigate MT, they enabled a guide to be followed but allowed the participants to deviate from the guide if it appeared appropriate. Interviews can be conducted via various forms of communication (e.g., face-to-face, telephone), which makes them accessible to a wide range of the population.

Quantitative Methods

Numerous quantitative measures of MT have been devised to assess MT levels, changes in MT, and the relationships between MT and other variables. Instruments have been created to assess overall MT (e.g., Mental Toughness Inventory; MTI, Gucciardi et al., 2015) and subcomponents of MT (e.g., Mental Toughness Questionnaire 48-item [MTQ48]; Clough et al., 2002, Appendix C). The questionnaires can be distributed via paper copies or online. Although researchers

can have more control over who completes the paper questionnaire, online distribution can allow a larger sample size.

The first attempt to quantitatively measure MT was the self-report Psychological Performance Inventory (PPI; Loehr, 1986). The 42-item instrument measured seven components that Loehr (1986) believed to be the most important components of the mentally tough athletes and coaches that he had worked with (self-confidence, attention control, negative energy, motivation, attitude control, positive energy, and visual and imagery control). Information on item development, validity, and reliability, of the scale was not provided, therefore Gucciardi et al. (2012) advised against the use of the PPI and findings from studies utilising the instrument should be treated with caution (e.g., Golby & Sheard, 2006).

Subsequently, researchers devised more rigorous measurements ranging from specific sport measures, such as Australian football (e.g. Australian Football Mental Toughness Inventory, Gucciardi et al., 2009), to more general measures of MT (e.g., MTQ48; Clough et al., 2002). Most instruments have been self-report. More recently Hardy et al. (2013) used an *informant-rated scale*, which involves an individual's MT being rated by an observer completing the questionnaire (e.g., a coach). Considering the context of the current thesis and the general nature of the consistently changing lifestyle behaviours, as well as the absence of the equivalent of a sport coach within lifestyle to complete an informant-rated scale, a self-report measure would be most appropriate in this thesis. When devising instruments research groups have placed greater emphasis on either rigorous statistical procedure (e.g. Gucciardi et al., 2009) or a strong conceptual underpinning (e.g. Clough et al., 2002).

Rigorous statistical procedures increase the reliability and model fit of a measure, however some aspects of MT are lost due to the removal of items which reduce the instruments reliability (Perry, Clough, Crust, Earle & Nicholls, 2013). For example, Gucciardi et al. (2015) reduced their 61 item Mental Toughness Inventory (MTI) to eight items, as 53 items were deemed not to display acceptable fit. The MTI achieved high model fit, which was at the cost of losing aspects of MT from the instrument. Researchers should look beyond statistical fit and consider practical impacts of poorer models (Perry et al., 2013). Furthermore, the eight item MTI offers assessment of MT as a unidimensional construct, which is accompanied with two main issues: (a) it may be too simplistic as all aspects of MT are incorporated into one score; and (b) it does not allow the identification of specific MT components (e.g., confidence, commitment) to be monitored, assessed, or targeted in development programmes.

Clough and colleagues (2002) placed great emphasis on the conceptual underpinning of their instrument. The MTQ48 emerged from combining pre-existing theory (i.e., hardiness) alongside empirical work with athletes, the MTQ48 also maintains good statistical properties; the instrument displays excellent internal consistency for overall MT (Cronbach alpha; $\alpha = .90$; Crust & Swann, 2011). In contrast, Gucciardi et al. (2012) conducted Confirmatory Factor Analysis (CFA) on the MTQ48 and reported a low model fit. His work was based on a skewed sample of university athletes, and a CFA should include participants from multiple backgrounds (Perry et al., 2013). Subsequently, Perry et al.'s (2013) CFA study reported good reliability for the MTQ48 amongst 8702 participants from a range of domains (students, senior managers, athletes, and administrative workers). The emotional control subscale displayed low reliability, meaning assessment of the

emotional control component is advised before proceeding with statistical analysis (Perry et al., 2013). Subsequent research highlighted that the cut off values for CFA reported by Hu and Bentler (1999) have potential limitations, as researchers use the values as a 'golden rule' and that can result in type II errors (e.g., incorrectly retaining a false null hypothesis). A number of commonly used sport and exercise psychology measures (e.g., MTQ48) do not meet these values (Perry, Nicholls, Clough, & Crust, 2015). Perry et al. (2015) proposed conducting Exploratory Structural Equation Modelling (ESEM) as opposed, or in addition, to CFA when assessing multidimensional models within sport psychology, due to ESEM better model fit.

The strong statistical properties discussed above, combined with a robust theoretical underpinning, may offer an explanation as to why the MTQ48 is the most commonly cited measurement of MT in published academic research. Based on the 4C's model of MT the instrument provides a score for each subcomponent (challenge, commitment, control, confidence) and the four subcomponents (control emotional control, life, confidence abilities, confidence interpersonal), which enables specific components to be explored or developed. Items in the MTQ48 have been supported by the previously discussed MTI which has strong statistical fit (e.g. the MTI item 'I believe in my ability to achieve my goals' reflects the MTQ48 item 'I am generally confident in my own abilities'; the MTI item 'I am able to execute appropriate skills or knowledge when challenged' appeared similar to the MTQ48 item 'I can usually adapt myself to challenges that come my way'). These example items from the MTQ48 assess the components confidence in abilities and challenge respectively, which highlights the MTI unidimensional approach to MT may lack the ability to differentiate between different components of MT. One advantage of the

MTI is the lower completion time, which can be beneficial if it is simply an overall MT that is required. In such cases, the Mental Toughness Questionnaire 18 item (MTQ18; Clough et al., 2002) can be completed, which is a reduced version of the MTQ48.

The generalisability of components in the MTQ48, such as interpersonal confidence, enables application to areas outside of sport (Crust & Swann, 2011). The MTQ48 has been successfully applied in areas such as education (Crust et al., 2014), business (Marchant et al., 2009), stress (Gerber et al., 2012), coping (Nicholls et al., 2008) and recently one lifestyle component; physical activity (Gerber et al., 2013). The high applicability to everyday life makes the MTQ48 appropriate for investigating MT in relation to lifestyle behaviour.

In addition to employing statistical tests to assess the statistical properties of an instrument, predominant quantitative statistical analysis within the literature has progressed the knowledge on MT. For example, correlational analysis has investigated the relationship between MT and dependent variables (e.g., progress up the business hierarchy; Marchant et al., 2009). Multiple linear regression analysis has enabled the predictive capability of MT in relation to other variables to be assessed (e.g., progress in higher education; Crust, Earle, et al., 2014). Furthermore, results from the MTQ48 enables the MT of a sample to be compared to the norm MT scores of the general population, by calculating scores of ten which are also known as sten scores (Clough & Strycharczyk, 2012). Sten scores are calculated by reference to a standard normal distribution, which provides a value between one and ten that can be used to classify MT level (e.g., sten 1-3 represents a low MT). These statistical tests offer a valuable contribution to expanding the current understanding of the concept of MT.

Mixed-Methods Research

Qualitative and quantitative approaches can have drawbacks and strengths, mixed-methods research can be employed to overcome the limitations of each approach if complementary methods are combined (Bryman, 2012). For example, quantitative investigation can identify the correlates of MT and can be applicable to a relatively large sample size, however they can fail to understand the reason for the existent or non-existent relationships; qualitative research can fill the gaps and attempt to explain the reported relationships, however, they are often based on small sample sizes and are not applicable to a large population (Braun & Clarke, 2013). Mixed-methods research can progress the current understanding of MT by taking a more holistic approach, for example offering explanations of quantitative findings using qualitative enquiry. This thesis aimed to understand high and low MT individuals' experiences. Therefore, sampling high and low MT during a quantitative phase, followed by a qualitative phase to explore their experiences, can offer first-hand accounts of the low mentally tough individuals.

Summary of the Methods to Investigate Mental Toughness

The qualitative methods progressed the understanding of MT, such as what it is and what it enables the individual to do. The quantitative approaches enabled correlates of MT to be explored, or changes in MT to be tracked over time. The MTQ48 appears the most suitable measure of MT for the lifestyle focused research in this thesis, as components such as interpersonal confidence increases the generalisability (Crust & Swann., 2011). The strong theoretical underpinning, and good model fit, supports the use of the MTQ48. Online distribution of the MTQ48 would appear appropriate to gain a larger sample size. Qualitative inquiry regarding MT can be achieved by interviewing (e.g., Jones et al., 2007). In order to progress

the MT literature, adopting a mixed-methods approach is one way to draw on the strength of each method and gain a deeper understanding of MT.

Part II: Health-Related Lifestyle Factors and Weight Loss

Overview

This thesis sought to contribute to the growing MT literature, by investigating MT and HRLF. This will extend the current limited research into MT and HRLF (e.g., Crust, Swann, et al., 2014; Gerber et al., 2013; studies discussed in more detail in Direct Relationships between Mental Toughness and Health Related Lifestyle Factors, p. 72). The second part of this literature review aimed to offer an overview of the current health status of the population in relation to lifestyle factors (physical activity, dietary consumption, and psychological wellbeing), to demonstrate the importance of exploring constructs that may assist individuals leading a heathy lifestyle. This section will also demonstrate why MT may be an appropriate individual difference that can assist in addressing the current health status of the population. This chapter does not aim to be an exhaustive review of HRLF, but instead provide the relevant literature to contextualise these HRLF within this MT focused thesis. Specifically the section will provide: (a) an overview of the current weight status of the population; (b) past and current lifestyle behaviours, and the recommendations for a healthy lifestyle; (c) a brief discussion of models of behaviours change; and (d) a review of the indirect relationships between MT and factors that are associated with a healthy lifestyle, (e.g., optimism and personality), as well as an overview of the direct relationships between MT and HRLF, in order to theoretically demonstrate the potential importance of MT within the context of lifestyle.

Current Weight Status of the Population Worldwide

Over the past three decades, obesity rates have nearly doubled (WHO, 2016). The aforementioned obesity and overweight prevalence (see Health Related Lifestyle Factors and Weight Loss, p. 4), identifying over half the adult population are overweight or obese (PHE, 2016), demonstrates this is a timely topic to investigate factors that influence one's health. Environmental changes over several decades have imposed lifestyle variations that have accelerated the decline in public health. Adoption and maintenance of physical activity and a nutritious diet, as well as protecting psychological wellbeing, is a subject of increasing importance for researchers and practitioners to address current health problems (e.g., excessive weight gain). Adhering to such behaviours is vital to achieve a healthy lifestyle that provides benefits such as increased life expectancy (Prospective Studies Collaboration, 2009), improved health related quality of life (Lasikiewicz et al., 2014), and reduced risk of excessive weight gain (WHO, 2016). Physical inactivity and unhealthy dietary consumption are the most modifiable risk factors of a healthy lifestyle (Cockerham, 2005), and are responsible for over 12 million deaths a year worldwide (Lim et al., 2012). Furthermore, there has been a decline in psychological health (Mental Health Network NHS confederation 2011), which can also inhibit leading a healthy lifestyle (Bose et al., 2009); some people resort to excessive food consumption in response to stress (Gibson et al., 2006). Exploring factors (e.g., MT) that influence the adoption and maintenance of physical activity and a nutritious diet, as well as protect psychological wellbeing, are important in order to modify lifestyle choices and achieve a healthy weight.

Environmental Factors and Health Related Lifestyle Factors

Environmental changes have influenced HRLF and resulted in greater prevalence of being overweight or obese (WHO, 2016). Leading an active lifestyle and consuming healthy foods was practically unavoidable before the industrial revolution; a time comprised of little transportation, predominately manual labour, and little convenience food – a contrast to the current day (Thirlaway & Upton, 2009). The number of stressors in the environment has also increased, inflicted by factors such as the rise in technology (Barber & Santuzzi, 2015). Therefore, environmental changes have impacted the obesity and overweight epidemic.

Physical activity levels have been negatively influenced by increased technology. A rise in technology has reduced active transportation (e.g., walking, cycling) and moderate intensity occupations (e.g., agricultural occupations), and increased light intensity and sedentary careers (e.g., service provider occupations; Church et al., 2011). These changes emphasise the importance of leisure time physical activity (Church et al., 2011), in which the individual must be motivated and energised, or *pushed,* towards being physically active (Michie, 2012).

Changes in dietary habits have also been influenced by environmental factors, such as urbanisation, which is associated with a shift from a high vegetable and cereal consumption to more processed unhealthy food intake (Filozof, Gonzalez, Sereday, Mazza, & Braguinsky, 2001). The rise in fast food consumption is partly attributable to the convenience, constraints, and lifestyle of the current population (Paeratakul, Ferdinand, Champagne, Ryan & Bray, 2003). Increased levels of technology have also been shown to increase the amount of food one consumes, for example the ‘mental stress’ associated with video games can increase food intake (Chaput et al., 2011). The changes in the environment make selecting healthier food

more volitional. Individuals must resist the cues and convenience, or the *pull*, of the temptation to eat unhealthy foods (Michie, 2012).

Environmental changes have also influenced psychological wellbeing. For example, the more flexible working environment to suit the modern busy lifestyle, which has involved increasing technology-mediated communications, can result in decreased wellbeing due to the increased pressure to communicate with colleagues when away from work (Barber & Santuzzi, 2015). Therefore, advances in technology can negatively impact psychological health. It is acknowledged that psychological health may not have declined as much as initially thought. The increase in instruments to assess an individual's mental health, as well as less associated stigma with discussing mental health, may have influenced the reported rates of psychological illness/wellbeing.

The discussed environmental changes have occurred at a population level, however not all individuals demonstrate the same response; some appear to maintain a healthy weight whereas others gain or lose weight. Changes in lifestyle behaviours are the mechanics of changing behaviour, which are focused on what people do to modify their energy balance; of an equivalent importance are factors that motivate individuals to lose weight (Stubbs, Brogelli, Pallister, Whybrow, Avery & Lavin, 2012). Therefore, individual factors that have contributed to the adoption and maintenance of an unhealthy lifestyle (e.g., lower physical activity, unhealthy diet consumption, and decreased psychological wellbeing) need to be investigated. This thesis aimed to examine the influence of MT on HRLF.

Current Lifestyle Recommendations

Public guidelines for physical activity levels and dietary consumption are provided by health professionals to educate individuals on the components of a healthy lifestyle (NHS, 2015b; NHS 2015c), in order to protect health, prevent excessive weight gain, and reduce lifestyle related diseases. Current physical activity recommendations suggest being active every day with a minimum total weekly requirement of two days of strength exercise for major muscles, as well as 150 minutes of moderate, or 75 minutes of vigorous, intensity exercise, or a combination of moderate and vigorous exercise to total 150 minutes (vigorous intensity exercise equates to two minutes of moderate exercise; NHS, 2015c). Over a third of the UK adult population do not meet physical activity guidelines (PHE, 2015c). People in the UK are failing to meet the recommended guidelines for a healthy, balanced diet. For example, the average sugar intake should equate to 5% of daily energy consumption (NHS, 2015b); on average 12% of an adult's daily energy intake is sugar (PHE, 2015b). Furthermore, less than half the adult population (19-64 years 30%) meet the five fruit and vegetables a day recommendation (PHE, 2015b). To ensure positive psychological wellbeing and reduce stress the NHS recommends having designated time away from work to socialise or exercise (NHS, 2015a). Despite recommendations, one in four people will experience a mental health problem in a given year (Mental Health Foundation, 2016).

As demonstrated above, gaps between the recommendations of healthy lifestyle behaviours and actual behaviours exist. These gaps demonstrate that providing knowledge is not sufficient to promote behaviour change (Kelly & Barker, 2016). Therefore, such gaps between the recommended and actual behaviours

necessitate the exploration of factors that increase adherence to healthy behaviours, enabling the recommendations to be met.

Methods to Investigate Health-Related Lifestyle Factors and Weight Loss

In order to assess and explore lifestyle factors and weight loss progress, qualitative and quantitative methods can be employed. HRLF and weight loss can be quantified to allow correlates of such variables, as well as changes in the measured variables (A deeper discussion on the statistical analysis of the data was provided in Methods to Investigate Mental Toughness, p. 38). To gain a deeper insight into lifestyle factors and weight loss, qualitative inquiry can capture one's experiences, perceptions, and attitudes. Methods of investigating lifestyle factors and weight loss are considered below.

Quantitative Methods

Physical activity. Doubly-labelled water and indirect calorimetry are thought of as gold-standard objective measures of energy expenditure. Indirect calorimetry consists of analysing respiratory gas, which involves a face mask or metabolic chamber that measures carbon dioxide production and oxygen over a given period of time (Thomas, Nelson & Silverman, 2005). Doubly-labelled water estimates energy expenditure through markers reflecting metabolism (Thomas et al., 2005). The methods offer an accurate and precise measure of energy expenditure, however factors such as being laboratory based, time consuming, and costly, present drawbacks from these methods. Therefore, these methods are not always feasible to investigate physical activity (e.g., in large sample sizes).

Methods such as pedometers and accelerometers can objectively measure physical activity. Whilst pedometers can only measure the number of steps taken

(e.g., walking; Tudor-Locke & Basset, 2004), accelerometers also account for the intensity, frequency, and duration of the movement (Chen & Basset, 2005). Accelerometers can be expensive; thus, they may not be appropriate for larger sample sizes. Additionally, contact with the participants would be required to distribute the accelerometers, meaning factors such as geographical location of participants requires consideration. Therefore, whilst accelerometers are effective measures of physical activity, a number of factors must be considered when using them.

Self-report physical activity questionnaires can assess an individual's typical physical activity levels. The International Physical Activity Questionnaire (IPAQ; Craig, 2003; Appendix D) is a widely-used instrument to assess one's average metabolic activity, calculated using participants reported vigorous physical activity, moderate physical activity, time spent walking, and time spent sitting. The short form offers a quick and easy assessment of physical activity. A meta-analysis of a range of physical activity measures reported that the IPAQ had a good reliability (Poppel, Chinapaw, Mokkink, Mechelen & Terwee, 2010).

Barriers to exercise. To investigate reasons behind the participants' physical activity levels, exercise barriers can be explored. The exercise barrier scale from the Exercise Benefits and Barriers Scale (EBBS; Sechrist, Walker & Pender, 1987; Appendix E) assesses the strength of participants' barriers to exercise, with a higher score representing a weaker barrier to exercise. The questionnaire assesses four barriers (a) exercise milieu (barriers created by the environment and surroundings), (b) physical exertion (physical pain is a deterrent from exercise), (c) time expenditure (time constraints inhibit exercise participation), and (d) family discouragement (barriers imposed due to family influences and responsibility). An

investigation involving 398 university students supported the exercise barrier scale reliability, which was reported to have good internal consistency (α =. 80; Brown 2005). Brown also reported a good construct validity, demonstrated by the correlation with self-efficacy (r = - .39, $p < 0.05$) (Brown, 2005). The EBBS displayed good test – re-test reliability amongst 66 healthy adults at two week intervals (r = .77), and good internal consistency based on a sample of 650 adults (α = .87; Sechrist, 1987).

Dietary behaviours. Dietary consumption and behaviours can be measured by direct objective measures such as biomarkers. Biomarkers can directly and objectively measure dietary intake through procedures such as sampling blood, hair, or adipose tissue (Potischman, 2003). Whilst direct measurements such as biomarkers are effective, they are costly and only capture specific food groups. Recording dietary content in a food diary can capture an individual's intake to assess their diet (Wrieden & Barton, 2003). Food diaries can be employed in larger sample sizes, limitations such as miss-reporting food consumed or portion sizes create limitations. Food diaries can often be recorded over a short period (e.g., 24 hours; Lawrence et al., 2015), and thus may not provide a true reflection of one's typical diet.

Alternative methods of assessing dietary consumption include questionnaires. Self-report questionnaires can assess specific food intake, for example the Cappuccio two-item dietary questionnaire (Cappuccio, Rink, Perkins-Porras, 2003), which measures one's fruit and vegetable intake. These measures can be restrictive to the specific food groups being investigated. Instruments such as The Dietary Quality Questionnaires (Toft, Kristoffersen, Lau, Borch-Johnson & Jorgansen, 2007) are more general, and measures and assesses intake of food groups such as, vegetables,

fruits, fish, and fats. Typical dietary behaviours, as opposed to specific foods consumed, can be measured to create a more holistic understanding of one's dietary intake. Blake et al.'s (2013) Eating Identity Type Inventory (EITI; Appendix F) measures four components that capture eating identities (a) healthy eating identity (being selective over food ensuring it is nutritional), (b) emotional eating identity (consuming food when feeling sad or stressed, or excessive amounts of food), (c) meat eating identity (consuming meat), and (d) picky eating identity (a restrictive diet which rarely incorporates new foods). The scores from the EITI can enhance the understanding of the relationship between a hypothetically important psychological influencer (e.g., MT) on eating identity, and dietary intake (Blake et al., 2013).

The EITI displayed high test-retest reliability (r = .66 to .84), and each subcomponent reported acceptable internal consistency (α = .61 to .82) with the exception of picky eating identity, which approached acceptable after the removal of one item (Blake et al., 2013). Supporting evidence for the relationship between reported eating identity measured on the EITI and actual dietary intake, provides support for the instrument assessing one's dietary intake. Blake et al. (2013) reported the eating identities were related to actual dietary behaviour. Healthy eating identity was significantly and negatively related to percentage of calories intake from fat (r = -.26, p < 0.001*)* and positively related to fibre (r = .20, p < 0.001*)*, and fruit and vegetable consumption (r = .35, p < .001). Fruit and vegetable consumption was negatively related to emotional eating (r = -.70, p < 0.05), meat eating identity (r = -.07, p < 0.5), and picky eating identity (r = -.21, p < 0.001). Picky eating identity was significantly and negatively associated with fibre intake (r = -.17, p < 0.001*)*. Furthermore, greater fat intake was significantly related to emotional (r = .09, p < 0.01*)* and meat eating (r = .28, p < 0.001) identity. Therefore, healthy eating identity

appears to be positively related to a healthier diet, whereas the three remaining eating identities are associated with an unhealthier diet.

Psychological wellbeing. Psychological wellbeing is predominantly assessed by questionnaires in which participants respond to statements on a Likert scale. It is generally agreed that measurement of psychological wellbeing is multidimensional. Ryff (1989) devised the Scale of Psychological Wellbeing (SPWB; Appendix G), which has been widely adopted by researchers. The SPWB assess one's psychological wellbeing, providing a score for each of Ryff et al. (1989) components of psychological wellbeing: (a) self-acceptance (positive evaluations of oneself and one's past life), (b) personal growth (sense of development and continued growth as an individual), (c) purpose in life (belief that one's life is meaningful), (d) positive relations with others (existence of meaningful relationships with others), (e) environmental mastery (capacity to effectively manage one's life and the surrounding world), and (f) autonomy (a sense of self-determination). Six components capture the multidimensionality of the construct.

The SPWB has good content validity, demonstrated by relationships between subscales and other constructs (e.g. the subscale self-acceptance with life satisfaction; Ryff & Keyes, 1995). Furthermore, a good internal consistency (α .65 to .83) and test-retest reliability have been reported (Ryff, 1989), however, some studies have not supported this (Van Dierendonck, 2004). The excessive overlap between scales has led to questions of the existence of a six-factor model (*c.f.* Springer, Hauser & Freese, 2006). Ryff and Singer (2006) supported the distinctiveness of the six dimensions of wellbeing, providing evidence from five categories of study (factorial validity, sociodemographic correlates, psychological correlates, biological correlates, and intervention studies).

Weight. Weight can be monitored by regularly recording weight via self-report or formal weigh-ins. Having a planned weigh-in may influence the individual's behaviour due to the weigh-in providing motivation and a goal to work towards. Self-reporting weight can reduce the effects of the researcher, however there is a risk of inaccurate recall. Self-reported weight can lead to participants providing values lower than their actual body weight (Gunnare, Silliman & Morris, 2013), more specifically weight loss samples were reported to under-report weight (Gorber, Trembley, Moher & Gorber, 2007), potentially due to social desirability. In contrast, Quick et al. (2015) reported students self-report body weight was predominantly similar to actual body weight. Issues may have arisen if participants were aware that in addition to self-report data they were also being followed up with the researcher taking actual body weight measures. In cases where minimal contact and support is intended self-report can be useful, as well as providing advantages such as opportunity for a large sample size with minimal cost. Therefore, both self-report and formal weigh ins appear appropriate depending on the aim of the study. For example, if weight loss were to be investigated whilst participants received minimal support then self-reported weight would be most suitable. In contrast, if an intervention with frequent support was being provided formal weigh-ins may be more appropriate.

Qualitative Methods

As earlier discussed (Methods to Investigate Mental Toughness, p.38), interviewing is a frequently used method within qualitative research. Interviewing has been used to investigate the lived experiences of individuals trying to lose weight (e.g., Rogerson, Soltani & Copeland, 2016), and discuss HRLF (e.g., McKee, Ntoumanis & Smith, 2013). The interviews can provide information rich data on

one's lifestyle behaviours (Smith & Sparkes, 2016). Potentially, individuals may find it difficult to discuss their experiences of sensitive subjects such as their weight, and consideration is required to gain a deeper insight.

Vignette. A vignette consists of fictional characters in a hypothetical scenario, which may be grounded on data gained from actual participants' accounts (e.g., data collected in semi-structured interviews; Allen-Collinson, Owton & Crust, 2016). The hypothetical situations can enable participants to discuss sensitive topics more comfortably than directly discussing their own experiences (Braun & Clarke, 2013). The scenarios are purposively vague to encourage the participants to fill in the gaps, however sufficient information and context is provided for the participant to gain an understanding of the scenario being depicted (Braun & Clarke, 2013). The vignettes tap into an individual's beliefs and attitudes on the topic (Barter & Renold, 1999). Obtaining prospective data could enable the participants' immediate responses to the given situation to be captured, and reduce reliance on retrospective recall. The vignette approach has previously been adopted within the health domain (e.g., exploring living with asthma, Allen-Collinson et al., 2016), potentially due to the ease of discussing sensitive topics as responses are provided in relation to the hypothetical character (Braun & Clarke, 2013). Thus, it appears a vignette may be an appropriate approach to explore health related lifestyle behaviours and weight loss.

Summary of Methods to Investigate Health-Related Lifestyle Factors and Weight Loss

There appears to be numerous methods to assess weight loss and HRLF. Quantitative methods enable objective measurements of behaviour and weight, which can be correlated with psychological variables (e.g., MT). For this thesis, questionnaires appear the most appropriate due to them being inexpensive to conduct

and applicable to large sample sizes. Specifically, the IPAQ will be used to assess physical activity, barriers scale from the EBBS to measure exercise barriers, eating behaviours will be assessed by the EITI, and the SPWB will assess psychological wellbeing of individuals. Assessing these variables in relation to MT can provide an insight into the role MT plays in HRLF. To gain a further interpretation of the quantitative responses a mixed-methods approach can be employed (Bryman, 2012). A mixed-methods approach was discussed in the Methods to Investigate Mental Toughness (p. 38). In the case of this thesis, quantitative relationships can be further explored during qualitative enquiry, to investigate the reasons for the reported relationships between MT, and HRLF and weight loss.

Barriers and Facilitators of Leading a Healthy Lifestyle and Losing Weight

Losing weight is a multifaceted process that is hard to achieve (Rogerson et al., 2016). Barriers and facilitators that influence one's ability to lead a healthy lifestyle and reach a desired weight require consideration, which is a focus in this thesis (i.e., how MT can influence one's approach to barriers and facilitators of HRLF and weight loss). This section discusses the barriers and facilitators of a healthy lifestyle. It is beyond the remit of this thesis to provide an extensive discussion of the topic. Instead, a brief synopsis is provided to illustrate the potential for MT to enhance HRLF and weight loss success.

Barriers to leading a healthy lifestyle are widely cited, including factors such as time constraints, (Mestral, Stringhini & Marques-Vidal, 2016), negative emotions (Koenders & Strien, 2011), limited access to facilities, cost, habitual behaviours, social pressures, and attitudes (Kelly & Barker, 2016; Mestral et al, 2016). Alternatively, some people may not possess such barriers, and simply do not wish to

lead a healthy lifestyle (e.g., be physically active or eat healthily). Therefore, these barriers will not be applicable to all individuals.

Qualitative research has examined the facilitators and barriers towards participants who have successfully lost, or are losing, weight (e.g., Rogerson et al., 2016). In Rogerson et al.'s (2016) study all participants were experiencing weight loss success at the time of interview, thus in line with the self-efficacy theory (Bandura, 1989) participants' success may have increased weight loss self-efficacy and influenced the findings. Nevertheless, key themes that hindered and enhanced physical activity levels and dietary consumption emerged (discussed below), which were commensurate with other researchers who investigated successful *and* unsuccessful weight loss experiences (e.g., McKee et al., 2013). McKee et al. interviewed participants who had lost 10% of their body weight; nine of whom had maintained their weight for 12 months and nine whom had regained their weight. Therefore, examining research based on a combination of successful and unsuccessful participants can create a clearer understanding of barriers and facilitators to a healthy lifestyle and weight loss.

Rogerson et al. (2016) reported self-control, such as being able to resist the temptation of foods at home that are for other family members, as well as having a lack of control over the environment (e.g., being called away for work can reduce availability of healthy food), can create barriers to leading a healthy lifestyle. Similarly, McKee et al. (2013) identified self-control as a key theme, participants who regained weight did not have a set routine or monitoring strategies in place. Furthermore, McKee et al. reported setting unrealistic, overly ambitious, short term, strict goals, can lead to individuals abandoning their behaviour change due to not reaching their target (McKee et al., 2013). Unrealistic expectations regarding the

time taken to adopt a habit can result in the individual giving up during the learning phase of the habit formation process (Gardner, Lally & Wardle, 2012). Facilitators of weight loss involved setting more realistic goals with a long-term view of lifestyle change as opposed to a short-term diet (Byrne, Barry & Petry, 2012). Thus, a lack of goals setting skills, or assistance in goal setting, can lead to unsuccessful behaviour change and subsequently unsuccessful weight loss.

The environment can also create barriers, which some people try to overcome to enhance their physical activity levels. The gym environment can promote social comparisons such as upward comparisons, which involves one comparing themselves to others who are perceived as being better. For some, upwards comparisons can promote commitment to exercise; however, to some women upward comparisons can be deflating if they have poor body satisfaction, and can be an important contributor to dropping out of the gym (Pridgeon & Grogan, 2012). This demonstrates low levels of satisfaction and confidence can inhibit the adoption of healthy lifestyle behaviours. On a similar theme of confidence, McGuire, Anderson and Fulbrook (2014) explored barriers to healthy behaviours amongst 41 Australian females who were predominantly obese (73.1% of sample were obese), and at risk of type II diabetes. Barriers to healthy behaviours, including fruit and vegetable intake and physical activity, encompassed “no one to help me”, “lack of information”, and “lack of help from health care professionals”. In contrast, some individuals who successfully lost weight reported seeking knowledge to understand the science and nutrition of their diet, as well as seeking new recipes, facilitated their ability to adopt new behaviours and enhanced weight loss progress (Rogerson et al., 2016). Therefore, being more confident at circumnavigating the barriers within the environment, or to seek help, assists the individual’s adoption of a healthier lifestyle.

Once a behaviour had been adopted, weight re-gainers reported the removal of positive reinforcement decreased their motivation towards maintaining healthier behaviours (McKee et al., 2013). Thus, weight re-gainers relied on external factors to remain motivated, with little mention of intrinsic motivation. An additional barrier to weight loss maintenance was a setback or lapse; a setback led to dichotomous thinking amongst some participants (McKee et al., 2013), which can result in an *all or nothing* response towards dietary behaviours and can cause cycles in weight loss progress (Rogerson et al., 2016). The more severe setback experienced the greater the weight gain (Burnette & Finkel, 2012). In contrast, successful weight loss maintainers viewed the setback as temporary and would move on (McKee et al., 2013). Therefore, how one perceives a situation can impact on the severity and subsequent behaviour.

Negative emotions (Koenders & Strien, 2011) and stress inhibit a healthy lifestyle. Negative emotions can result in emotional eating due to fatty textured food relieving stress (Gibson, 2006). For example, 33% of adults reported consuming unhealthy foods, or overeating, to distract themselves from stress (APA; American Psychological Association, 2013). Enhancing coping ability in relation to the barriers can increase weight loss outcomes (Byrne et al., 2012); Murawski et al. (2009) found enhanced problem solving ability to be associated with greater weight loss outcomes. Therefore, psychological factors create barriers to leading a healthy lifestyle, and effective coping mechanisms can enhance weight loss success.

It appears that numerous barriers to leading a healthy lifestyle are perceived, and it may be how the challenge or obstacle is appraised that plays an important role. For example, on average in one day people spend eight hours at work, eight hours sleeping, and one hour commuting to and from work, which leaves seven hours of

the day. Therefore, it would appear most people can feasibly complete a 30-minute exercise session (Thirlaway & Upton, 2012), or take the time to prepare a nutritious meal. However, time constraints remain a frequently citied barrier to exercise (Kelly & Barker, 2016). This highlights the importance of an individual's perception of their environment and their abilities to overcome barriers, to facilitate the adoption and maintenance of a healthy lifestyle.

There are an array of barriers and facilitators towards healthy lifestyle behaviours and weight loss. Although exposed to similar environments, individuals can react and respond to barriers and challenges in different ways. Some people can resist temptation, overcome challenges, and are motivated to be healthy, whereas others do not resist temptation (Michie, 2012). It appears individual differences are an important consideration for behaviour change. The majority of the barriers are perceived and appear solvable, and a number of the facilitators appear within the individual's control.

Summary of Barriers and Facilitators of Leading a Healthy Lifestyle and Losing Weight

The aim of this thesis was to investigate MT, and HRLF and weight loss. On reflection of the barriers and facilitators, the majority were perceived and solvable. MT appears an appropriate individual resource to address the barriers. For example, MT is associated with resisting temptation (Cook et al., 2014), bouncing back after setbacks (Bull et al., 2005), being in control (Clough et al., 2002), effective coping skills (Nicholls, Levy, Polman & Crust, 2011), and holding the confidence to seek help and learn new skills, which are congruent with the discussed characteristics of successfully leading a healthy lifestyle and maintaining weight loss.

Models of Behaviour Change – Theoretical Frameworks

Initiatives and interventions such as the 'Change for life' scheme aim to promote the adoption of sustainable lifestyle changes within the UK to create a healthier population, by trying to reduce barriers and enhance facilitators of HRLF. Thirlaway and Upton (2009) acknowledged the importance of interventions to utilise a theoretical model of behaviour change. Models of behaviour change exist based on different theoretical approaches: belief/attitude theories; control-based theories; stage based theories; competence based theories; Hybrid models, as displayed in Figure 2.5 (Biddle & Mutrie, 2008). The current thesis provides a brief synopsis and critique of the leading models of behaviour change (for a full discussion on models of behaviour change see Thirlaway & Upton, 2009), which are identified as the most common and appropriate for enhancing lifestyle behaviours (Morris, Marzano, Dandy & O'Brien, 2012). The models discussed in this thesis are the: Health Belief Model (HBM; Hochbaum, 1958), Theory of Planned Behaviour (TPB; Ajzen & Madden, 1986), and Transtheoretical Model (TTM; Prochaska & DiClemente, 1986). The discussion on the models is to inform the current work in this thesis of factors that can influence behaviour change (e.g., control is important in the TPB), it is not an aim of the current thesis to test, extend, or implement, the discussed models.

The HBM and the TPB are two of the predominant cognitive models. The HBM suggests the likelihood of the individual adopting preventive health behaviours is determined by their perception of the severity of the potential illness, in addition to the costs and benefits of the behaviour (Browning & Thomas, 2005). Out of the components of the HBM, perceived barriers are the most significant predictors of behaviour (Janz & Becker, 1984), which suggests an individual's perception of a

given situation may influence their lifestyle choices (e.g., if entering a gym is perceived as a threat it may mean less chance of attending the gym, however, if the gym is viewed as an opportunity for self-improvement it may increase the likelihood of attending the gym).

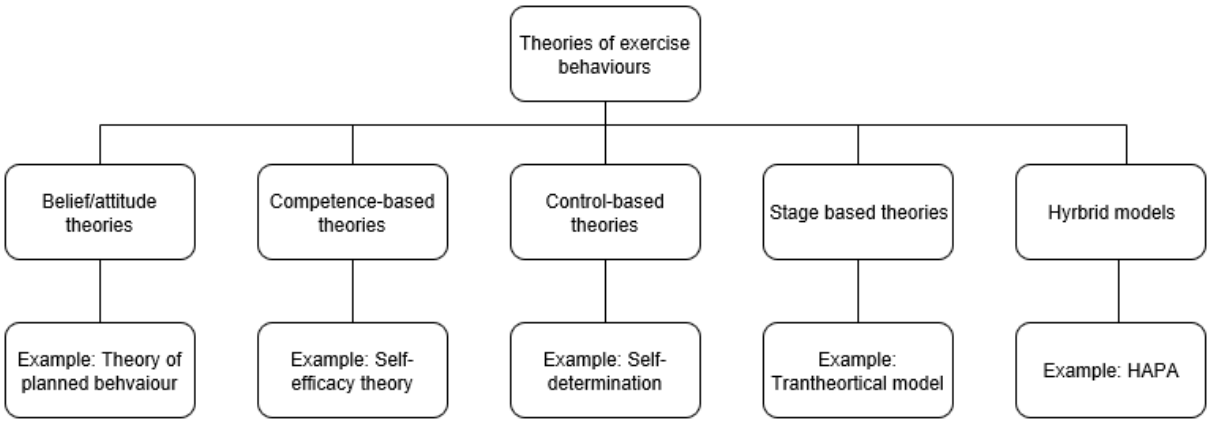

Figure 2.5. A Framework for Classifying Theories of Physical Activities (Biddle & Mutrie, 2010, p. 36)
Note. HAPA = Health Action Process Approach

In contrast, the TPB highlights the importance of intentions that are the best predictors of actual behaviour (Biddle & Mutrie, 2008). Not all individuals meet their intentions, a behaviour-intention gap exists that accounts for 36% of people who hold intentions for a specific behaviour but do not achieve it (Rhodes & Bruijn, 2013). Therefore, there must be further contributing factors that influence behaviour. One of the main strengths of the TBP is the inclusion of the perceived behavioural control dimension, which reflects the importance of having a sense of control to enable intentions to be met. An internal locus of control is related to a healthier diet and more frequent exercise (Cobb-Clark, Kassenboehmer & Schurer, 2014), as well as being an important component of leading a healthy lifestyle and achieving weight loss (McKee et al., 2013).

Despite their merits, these cognitive models fail to account for the social and emotional responses to the behaviour (Browning & Thomas, 2005). If negative

emotions are initially experienced, maintenance of the desired behaviour can become difficult without effective strategies in place, or if suitable individual differences are not possessed. Therefore, as well as behaviour adoption the models must also consider behaviour maintenance, as lifestyle behaviours are not acute behaviour changes (e.g., having a vaccination) but are ongoing processes that once adopted must be maintained (Thirlaway & Upton, 2009).

The TTM offers a stage of change theory and acknowledges the importance of promoting behaviour maintenance. This model suggests the individual moves through a continuous cycle of stages of behaviour adoption, maintenance, and dropout (pre-contemplation; contemplation; preparation; action; maintenance), with suitable interventions required for the individual during each stage. A main benefit of the TTM, which the HBM and TPB lack, is the distinction between phases such as behaviour adoption and maintenance. Different important psychological factors have been reported depending on the point of behaviour change the individual is at (Rothman, 2000). For example, the types of goals set may need to differ between behaviour adoption and behaviour maintenance (O'Donnell, Greene & Blissmer, 2014). Therefore, it is logical that matching the intervention to the individual's stage of change is important.

Woods, Mutrie and Scott (2002) investigated the TTM, by providing university students in the contemplation and precontemplation phase a six-month stage-specific intervention. The intervention consisted of mail delivered instructions to provide increased awareness and the benefits of physical activity within the university environment, as well as encouraging commitment towards physical activity and rewarding students for being physically active. Significantly more of the intervention group improved their exercise stage of change (80%) compared to the

control group (68%). By the end of the six-month intervention 45% of the experimental group were in the regularly active stages compared to 33% of the control group. Only 50% of participants responded at follow up, potentially those who had not progressed through the stages of change may have been less inclined to respond. Whilst this study presents the benefit of providing the students a stage-specific intervention, it may be that irrelevant of the stage of change any intervention targeting increasing physical activity will provide benefits to the students' physical activity levels. The absence of evidence in reference to creating lasting behaviour change reduces support for the effectiveness of the TTM, as a large proportion of research has only assessed the short-term effects of the model (Biddle, Mutrie, Gorely, 2015). Although it is debatable as to whether behaviour change can be divided into distinct stages, identifying it as an ongoing process progresses previous models that view behaviour change as a discrete event (Thirlaway & Upton, 2009). Despite such limitations, the TTM is still used extensively and provides an important understanding of the process of behaviour adoption and maintenance.

It could be argued that the models convey a false image that behaviour change is a neat linear process (e.g., TTM), and they fail to capture real life challenges. For example, obstacles can inhibit behaviour change resulting in deviations from the expectations of the model (e.g., stressful event can inhibit healthy behaviour adoption; APA, 2013), and individuals may not always follow the chronological stages of change. People may have various perceptions of, and responses to, a situation depending on individual differences. Some models fail to place adequate attention on, and capture, such important influential aspects of behaviour change. Despite limitations, these models offer valuable knowledge regarding factors that researchers have identified as important for sustainable

behaviour change; for example, perceptions of the behaviour (e.g., risk/threat), perceived control over the environment, perceived barriers, and maintenance of behaviour following behaviour adoption.

The cognitive based models (i.e., HBM, TRA) offer a description of the important psychological correlates (e.g., perceived control), whereas the theoretical models build knowledge and understanding of how and why people may be motivated to lead a healthy lifestyle (Biddle & Mutrie, 2008). Some people do not respond to interventions informed by such models and fail to adopt new behaviours, others successfully adopt new behaviours and can maintain them post intervention, whereas others return to old habits once the intervention has ceased (Kong et al., 2012). Evidently, achieving effective behaviour change is difficult and is confronted with barriers that can lead to attrition (Kong et al., 2012). For example, 77% of participants dropped out of a lifestyle intervention targeting physical activity and dietary consumption (Inelman et al., 2005). Therefore, exploring factors that help individuals overcome barriers and facilitate sustainable behaviour change is important, and psychological factors appear one method of predicting attrition (Geraghty, Wood & Hyland, 2010).

Summary of Models of Behaviour Change

This section has demonstrated the key factors that influence HRLF. It appears aspects such as perceived control (e.g., TPB), appraisal of the threats and benefits of a behaviour (e.g., HBM), and long-term maintenance (e.g., TTM), are important considerations for behaviour change. Furthermore, it is apparent that the individual plays a central role (i.e. individual differences and individual perceptions) in behaviour change (Dixon, 2008). Models consider individual differences such as the *confidence* to perform the desired behaviour (e.g., HBM), and the *motivation* to

engage in the behaviour (e.g., TTM; Dixon, 2008). Furthermore, perceived behavioural control, perceived knowledge, personal skills, and restraints of the environment, influence an individual's perception towards changing their behaviour (Dixon, 2008). This highlights the necessity to consider individual differences and perceptions, which incorporate the aforementioned factors when aiming to modify behaviour. Therefore, characteristics of MT would be expected to enhance one's behaviour change, for example the associated high levels of perceived control (Cook et al., 2014), perseverance and adherence to a task (Gucciardi et al., 2016), confidence in abilities to learn new behaviours (Clough & Strycharczyk, 2012), and intrinsic motivation to achieve goals (Gucciardi et al., 2008).

Individual Differences in Lifestyle Behaviours

This thesis aimed to investigate the role of the individual difference MT on HRLF and weight loss. Possessing certain traits and characteristics can enable effective behaviour change towards a healthier lifestyle. MT encapsulates an array of individual differences that are associated with positive behaviours in relation to leading a healthy lifestyle (e.g., confidence; McGuire et al., 2014), thus MT appears a suitable individual difference to explore this subject.

Mutual Correlates between Mental Toughness and Health Related Lifestyle Factors

So far, this chapter has presented an in-depth review of the MT literature, and the call to explore psychological correlates that can influence HRLF and weight loss. Seemingly, health related lifestyle behaviors appear a domain where MT can be applied, and offer a benefit to the population; to further investigate if MT is appropriate to investigate in relation to HRLF, indirect as well as direct links need to

be considered between MT and HRLF. This can help understanding of the theoretical underpinnings as to why MT can enhance lifestyle factors. Examples of theoretical links are presented below, by discussing correlates of MT that are also associated with behavior adoption and maintenance of HRLF.

Whilst this section does present the potential links between MT and HRLF, it is acknowledged that the domains that MT has previously been researched in may differ from HRLF. For example, whilst sporting competitions and completing a university degree have clearly defined end points and indicators of success, which once achieved remain with the individual (e.g., medal, degree), HRLF is less clearly defined. Although a weight loss goal can be achieved, if an individual does not continue to lead a healthy lifestyle they may no longer be deemed as successfully maintaining their goal. Thus, this thesis also proposes the question of how applicable is MT to HRLF.

Indirect Relationships between Mental Toughness and Health Related Lifestyle Factors

Optimism. Optimism is the expectancy for a positive outcome versus a negative outcome, and is significantly and positively correlated with MT (Nicholls et al., 2008). Optimistic individuals may tend to participate in health promoting behaviours, for example optimism is significantly related to exercise frequency (r = .18, $p < 0.05$; Kavussanu & McAuley, 1995). Sproesser, Klusmann, Schupp & Renner (2015) identified that holding optimistic views about food consumption, such as one believing that their diet is healthier than their average peers, was positively correlated to healthier eating behaviour (r = .34, $p < 0.01$) amongst 799 overweight individuals (BMI = 24.8 kg/m²). In addition, all six subscales of Ryff's (1989) model of psychological wellbeing are significantly and positively related to optimism (r =

.38 to .59; $p < 0.01$), which may be partly attributable to the significantly more effective coping skills (e.g., logical analysis) to overcome stress and challenge amongst optimists ($r = .28$, $p < 0.01$; Nicholls et al., 2008). Therefore, optimism appears beneficial in terms of HRLF.

Self-efficacy. Self-efficacy, which is an individual's belief in their ability to carry out a course of actions, predicted adherence to a 12-month exercise programme in older adults (McAuley et al., 2011). In the initial stages of an exercise regime, exercise frequency was associated with components of self-efficacy, such as beliefs in physical abilities and confidence that exercising through barriers will pay off. Greater self-efficacy increases the chance of adhering to exercise regimes until the behaviour has become habitual to a certain extent (Sherwood & Jeffery, 2000). Therefore, self-efficacy would be expected to enhance one forming a habit that leads to healthier lifestyle behaviours.

Coping. More effective coping behaviors are associated with MT. For example, a negative relationship was reported between MT and behavioral disengagement ($r = -.38$, $p < 0.01$; Kaiselar, Polman & Nicholls, 2009). The positive relationship between MT and planning ($r = .23$, $p < 0.01$; Kaiselar et al., 2009) may assist individuals in overcoming barriers to healthy eating, such as a lack of time to prepare food (Mestral et al, 2016). Effective coping skills such as effort expenditure are related to MT ($r = .26$, $p < 0.01$; Nicholls et al., 2008), and could be related to greater levels of the frequency and intensity of physical activity. Less effective coping responses that are negatively related to MT (e.g., resignation, $r = -.28$, $p < 0.05$; Nicholls et al., 2008) are associated with pessimism ($r = .33$, $p < 0.05$). Pessimism refers to one's expectation of undesirable outcomes and a more negative outlook, and may cause a deceased psychological wellbeing. Thus, there appears

potential links between MT and effectively coping with barriers and stresses when trying to lead a healthy lifestyle.

Adherence. Adherence refers to an individual's commitment, Levy et al. (2006) reported MT was significantly related to adherence to a sports rehabilitation clinic (r = *.30, p* < 0.05) amongst 70 patients, however significantly less constructive behaviors were demonstrated during the session by the mentally tough participants (*r* =-.28, *p* < 0.05; Levy et al., 2006). This demonstrated that although mentally tough individuals have greater adherence towards attending sessions, they do not engage with the service as much as the low mentally tough individuals. Adherence to one of three diets was significantly related to 12-month weight change (Atkins diet; *r* = 0.42, *p* <0.01; Zone diet; *r* = 0.34, *p* <0.01; Ornish diet; *r* = 0.38, *p* <0.01), which indicates enhancing adherence may require greater focus than the specific macronutrient consumption for successful weight loss (Alhassan, Bersamin, King & Gardner, 2008). Therefore, finding factors that enhance one's adherence to health-related behaviors appear to enhance HRLF and likelihood of weight loss.

Perseverance. Behavioral perseverance is a characteristic of mentally tough individuals, which accounts for 5.4% of the variance in perseverance at a multistage shuttle-run test conducted with 330 male Australian footballers (Gucciardi et al., 2016). Behavioral perseverance would be expected to be a desirable trait when trying to adopt and maintain new behaviors, for example persevering during challenges and difficulties may assist circumnavigating problems such as a lack of willpower and self-control around food (Mestral et al., 2016; McKee et al., 2013). Additionally, perseverance may assist one to rebound from setbacks in their behaviour change. In line with the self-efficacy theory (Bandura, 1989), if one persists and perseveres to reach a goal this can result in positive affect which may enhance psychological

wellbeing. Behavioural perseverance would be expected to enhance one's adoption and maintenance of HRLF.

Psychological skills. Crust and Azadi (2010) reported psychological skills such as goal setting (r = .28, p < 0.01) and self-talk (r = .37, p < 0.01) have been significantly and positively correlated with MT. Mann, Palmisano & Lin (2016) reported participants of an experimental group who set SMART goals (see Locke & Latham, 1990) significantly increased their daily steps (+1417.99 ± 2284.69, p < 0.01) compared to a control group (-597.5 ± 2317.24, p < 0.01). One's psychological skills appears important for assisting individuals to lead a healthy lifestyle

Personality. Personality is the sum of the unique characteristics an individual possesses (Hollander, 1967). The FFM is the most widely accepted and commonly used model of personality (Horsburgh et al., 2009), and components of the model are significantly related to MT (discussed in the Development of Mental Toughness, p. 32). The FFM displays significant relationships with BMI, obesity status, physical activity levels, and dietary behaviour (e.g., Keller & Siegrist, 2015). Conscientiousness predicts BMI (β = -0.86, P < 0.01) and obesity status (β = -0.03, p < 0.05; Kim, 2016). These relationships can be attributed to one's physical activity levels and dietary consumption. For example, Elfhang and Morey (2008) identified the importance of conscientiousness, which positively influenced dietary consumption. Interestingly the self-discipline scale of conscientiousness displayed the strongest relationship with the healthier eating behaviours (i.e., high restrained eating, low emotional eating and external eating). These relationships demonstrate the importance of self-control in leading a healthy diet, as well as being committed to plans, which researchers have reported to facilitate healthy lifestyle behaviour maintenance (e.g., McKee et al., 2013; Rogerson et al., 2016). Personality also

influences physical activity levels, a systematic meta-analysis involving 36 studies that assessed the FFM and physical activity reported extraversion was positively related to physical activity due to characteristics such as sociability (Rhodes & Smith, 2006). Therefore, personality appears an important influencer on HRLF and weight loss.

Direct Relationships between Mental Toughness and Health Related Lifestyle Factors

Mental toughness and physical activity. Physical activity is a key component of a healthy lifestyle, and has recently been studied in relation to MT in a quantitative (e.g. Gerber et al., 2012) and a qualitative capacity (e.g. Crust, Swann, et al., 2014). Gerber et al. (2012) assessed the relationship between 284 Swiss high school students' MT (assessed using the MTQ48) and their physical activity levels (assessed using the IPAQ). Students who met the current physical activity guidelines reported significantly higher MT than those who did not. MT was significantly and positively related to moderate and vigorous physical activity. Specifically, moderate exercise was significantly and positively related to all components except interpersonal confidence, and vigorous exercise was significantly and positively related to challenge, emotional control, and confidence in abilities. Life control, commitment, and challenge, were significantly higher in those who achieved the recommended physical activity levels. This is in line with Crust and Clough (2005) who reported control to be the strongest variable related to time holding a dumbbell weight during a muscular endurance task completed by university students; these individuals may have greater control over their emotions and the extent to how much the pain of exercise affects them. Challenge appears an important component in relation to physical activity, potentially due to the individual

viewing physical activity as an opportunity for self-improvement. This study provided an alternative, more general, angle of MT to the commonly researched performance-orientated perspective. Although offering an insight into the relationship between MT and physical activity, the cross-sectional nature of the study does not explore whether the behaviours were maintained over long time periods.

Crust, Swann, et al. (2014) sought to explore the maintenance phase of behaviour change. Interviews were conducted with exercise leaders, and exercisers who the leaders deemed as mentally tough based on their behaviours during the classes. Mentally tough exercisers were reported to have high levels of commitment to classes, rapid refocus following setbacks or success, remaining positive when encountering tough circumstances, and arriving early for classes. The previously discussed harmful effects of MT in relation to exercise should not be dismissed. Some leaders reported seeing exercisers in the gym when they were injured and had been advised to rest. Therefore, MT appeared predominately beneficial to exercise adherence, however drawbacks could exist for some.

Mental toughness and diet. The relationship between MT and diet has not currently been explored by psychologists, however based on their expertise and knowledge of MT Strycharczyk and Clough (2015) believe that mentally tough individuals will have greater control over the food they consume. Despite the lack of research, the earlier discussed correlates of MT provide grounds to expect MT and dietary behaviour to be related, and this thesis aims to contribute to developing the understanding of MT and dietary behaviours.

Mental toughness and psychological wellbeing. Psychological health has been investigated in relation to MT, which is important during the context of this

thesis as low psychological health can result in weight gain (Bose et al., 2009). Following a narrative review, Gucciardi et al. (in press) concluded that MT may represent a positive indicator of mental health. Golby and Wood (2016) reported a greater MT is significantly and positively associated with a higher positive affect (positive feelings and emotions; $r = .67$, $p < 0.01$). The positive relationship may be due to characteristics of MT, such as commitment and perseverance. The higher levels of continuous effort may cause the individual to feel as though they are mastering a new skill, which in turn can enhance perceptions of positive affect (Mahoney, Gucciardi, Ntoumanis & Mallett, 2014).

Gerber et al. (2013) reported MT was negatively and moderately correlated with depressive symptoms, and positively and moderately correlated with life satisfaction amongst 284 Swiss students. MT was significantly higher for the students in the well-adjusted group characterised as having low stress scores at baseline and 10-month testing, whereas students with maladjusted profile (high stress scores at baseline and 10-month testing) displayed the lowest MT score. Unfortunately, the individual components of MT were not explored. Identifying specific MT variables that are related to psychological health amongst university students would improve support for students through targeted interventions.

Summary of the Correlates of Mental Toughness

This discussion on the mutual correlates of MT and HRLF presents strong theoretical grounds for MT to influence physical activity levels, dietary behaviours, and psychological wellbeing, which can all influence one's body weight. Furthermore, there is emerging evidence of direct relationships between MT and these HRLF. Therefore, this thesis aims to expand the current knowledge and further investigate these relationships.

Summary of Literature Review

This chapter has provided a literature review of MT, and an overview of the HRLF of the population. The concerning weight problems of the population have been presented, and MT appears a potentially important individual difference that may enhance one's ability to modify HRLF and lose weight. The examples of mutual correlates between MT and HRLF provide an underpinning for the potential theoretical relationships between these variables, as well as research that demonstrates direct relationships (e.g., MT and physical activity; Gerber et al., 2012). The following five chapters will draw upon knowledge discussed in the literature review to inform the empirical studies, and address the research objectives of the current thesis.

Chapter Three: Study One – The Relationship between Mental Toughness and Health Related Lifestyle Behaviours[2]

[2] Two manuscripts based on this chapter have been published in *Personality and Individual Differences* (Stamp, Crust, & Swann, 2014) and *International Journal of Sport and Exercise Psychology* (Stamp, Crust, Swann, & Perry, 2016) - see Appendix V and Appendix W.

Introduction

Chapter Two discussed HRLF that can influence one's weight, and the potential of MT as an important individual difference to influence these health factors. To address the overarching aim of this thesis, the current chapter will take the first step to investigate MT in relation to HRLF (i.e., physical activity, exercise barriers, dietary intake, and psychological wellbeing). In the context of this thesis the HRLF were the *processes* that lead to the *outcome* (i.e., weight loss). One population who are at risk of adopting an unhealthy lifestyle are university students (Bray & Born, 2004). This first study presented in the current chapter aimed to investigate the relationship between MT and HRLF in university students, who are *at risk* of leading an unhealthy lifestyle. Additionally, university students are exposed to challenges and stressors (Mackaskill, 2013), and MT is associated with more effective coping skills (Nicholls et al., 2008). Understanding these relationships in more detail would progress the current knowledge on MT in relation to HRLF. The first study in this thesis will address research objective one (i.e., investigate MT and HRLF in a population at risk of leading an unhealthy lifestyle and gaining weight).

Attending university is a critical life period, which is characterised as a non-homeostatic and challenging event (Dietz, 1994) that places the student at risk of adopting unhealthy lifestyle behaviours (Finlayson et al., 2012). Entering higher education has been identified as a common time for weight gain (Provencher et al., 2009), where weight increase is greater than that of the general population (Levitsky, Halbmaier & Mrdjenovic Levitsky, 2004). Following a meta-analysis of 32 studies, an average of 60.9% of students were reported to gain weight during their first year of university (Vadeboncoeur, Townsend & Foster, 2015). Mean weight gain was

1.36kg over the first five months of university; when those who did gain weight were further investigated in isolation weight gain average was 6.38kg. Increase in weight continues after the first year of university. For example, weight during second year of university (males = 72.7kg, females = 61.7kg) has been reported to be significantly greater than weight at the end of college (males = 68.5kg, females = 59.8kg, $p < 0.05$; Deforche, Van Dyck, Deliens & Bourdeaudhuij, 2015). Therefore, exploring MT in relation to factors that influence one's weight may offer an insight into potential ways to reduce weight gain prevalence.

There is an abundance of evidence that suggests the university environment can present students with challenges and stressors that impact physical activity levels, dietary consumption (Fromme, Corbin & Kruse, 2008), and psychological health (Mackaskill, 2013), all of which can contribute to weight gain (WHO, 2016). Extensive research has focused on the transition from further to higher education (e.g. Bray & Born, 2004; Kremmyda, Papadaki, Hondros, Kapsokefalou, & Scott, 2008; Scanlon et al., 2010). This may be understandable as first year of university is commonly characterised by numerous challenges, including the individual leaving the family home for the first time, budgeting money, forming new friendships and support systems, and adjusting to new learning regimes (Fromme et al., 2008; Scanlon et al., 2010). However, challenges have been associated with each year of study at university.

Focusing on first year of university does not capture the extent of psychological stressors that effect students, as demonstrated by Macaskill (2013) who investigated the stressors and challenges across all years of undergraduate study (Macaskill, 2013). In a large-scale study of 1197 undergraduate students, Macaskill

identified that second year students displayed the most prevalent psychiatric symptoms. Second year presents a new range of stressors such as moving out of university accommodation, new support tutors and modules, as well as the grades beginning to count towards students' degree classification in many UK universities. Some of these potential stressors continue into third year, as well as additional challenges such as dissertation completion, preparing to exit education, and finding postgraduate study or a job (Mackaskill, 2013). All years of undergraduate study appear to require research attention due to stressors and challenges throughout time spent at university, which require effective coping mechanisms to be overcome and reduce the chance of an unhealthy lifestyle being adopted. Therefore, this study includes students from all years of undergraduate study.

Changes in Students' Lifestyles

Changes in physical activity levels and dietary behaviour have been reported when students attend university and can result in implications such as weight gain (Wengreen & Moncur, 2009). Bray and Born (2004) reported 66% of 145 Canadian undergraduate students were physically active prior to attending university, this decreased to 44% of the students meeting physical activity guidelines during their first two months of undergraduate study. Leisure time sport has been reported to significantly decrease from 185 minutes per week to 111 minutes per week amongst 150 students during their transition from high school to university (Van Dyck, Bourdeaudhuij, Deliens, & Deforche, 2015). Simultaneously, self-efficacy significantly decreased from high school (self-efficacy score: 3.46) to university (self-efficacy score: 3. 36), which Van Dyck et al. (2015) suggested could be due to the drastic changes in the environment; the decrease in self-efficacy may be a result of trying to overcome university challenges (e.g., assignment deadlines). Therefore,

other objectives are prioritised besides exercise, causing a reduction in physical activity.

Barriers to being physically active amongst university students include; lack of family support, high academic workload, lack of transport to facilities, lack of time, and perceived unpleasantness of exercise (Daskapan, Tuzun & Eker, 2006; Gyurcsik, Spink, Bray, Chad & Kwan, 2006; Lovell, Ansari & Parker, 2010). It appears most reported barriers to exercise amongst the general and student population are perceived (within personal control), solvable, and are more indicative of priorities. Thus, it is likely that individuals who have high control over their lives, for example effective time management, perceive fewer barriers to exercise. Therefore, both perception of barriers, as well as individual differences (e.g., self-efficacy), appear important in the role of students being physically active.

Dietary behaviour can decline when attending university, and less healthy eating behaviours are evident. Wengreen and Moncur (2009) reported significantly greater calories, fat, and fast food consumption, as well as a significantly lower intake of protein, fruit, and vegetables, once individuals had started studying at university. Environmental stimuli can create a barrier to healthy dietary behaviour (Levitsky et al., 2004), as demonstrated through studies that have investigated the effects of students remaining in a similar environment of being at home, to those who left home and entered new surroundings. Kremmyda et al. (2008) reported that amongst 135 first year Greek university students, those who moved away from the family home consumed significantly less fruit and vegetables compared to students who remained living in their family home. Furthermore, Kremmyda et al. identified students who moved to the UK gained significantly more weight than those who moved away from home but remained in Greece.

The environment including *all you can eat* style restaurants, readily available food in catered accommodation, and accessible junk food in student halls, can potentially contribute to students increased daily calorie intake (Levitsky et al., 2004). Although the environment appears to influence weight change, the majority of the discussed factors appear to be controllable by the individual (e.g. resisting temptations of the additional food). Similar to physical activity, it would appear that the individuals' ability to remain in control of their dietary choices, follow the lifestyle they desire to lead, and resist temptation, affects their dietary consumption. Furthermore, self-control was regarded as important for favourable eating behaviours (e.g., resisting temptation) amongst female college students (Lopez, Milyavskaya, Hofmann & Heatherton, 2016). This highlights the importance of individual differences, as well as the already discussed perceived barriers, when considering students' dietary consumption.

Psychological health is an additional attribute that influences the healthiness of a student's lifestyle, and can contribute to weight gain (Bennett, Greene & Schwartz-Barcott, 2013). Factors including, difficulty adjusting to the demands of coursework, feeling lonely or homesick, and ineffective time management can inhibit psychological wellbeing and inflict stress (Cooperative Institutional Research Program; CIRP, 2015). Several stressors are reported amongst university students and a high number of stressors are associated with unhealthy behaviours, such as less healthy dietary consumption (Papier, Ahmed, Lee & Wiseman, 2015). This demonstrates the importance of taking a more holistic approach and considering psychological, as well as physical (e.g., physical activity, and dietary consumption), contributors to the healthiness of students' lifestyle.

A number of studies have concentrated on psychological health in terms of mental illness symptoms amongst students (e.g. Kulsoom & Afar, 2015; Lovell et al., 2015). As mentioned in Chapter One, psychological health is not solely a lack of psychological illness it is also positive human functioning and flourishing (Seligman & Csikszentmihalyi, 2000). Stress can decrease psychological wellbeing by inhibiting individuals from effective functioning, which can impair maintenance of healthy lifestyle behaviours (Nigg, Borrelli, Maddock & Dishman, 2008).

It is apparent that physical activity levels, dietary consumption, and psychological health of university students can all be negatively impacted by the university environment. Behaviours adopted at university can continue for up to five years post-graduation (Sparling & Snow, 2002) and impact future lifestyle choices (Finlayson et al., 2012). Therefore, considering the current obesity epidemic worldwide (WHO, 2016; PHE, 2013) it is important to explore the correlates of behaviours that can lead to adopting an unhealthy lifestyle (e.g., low physical activity levels, high calories intake, low psychological wellbeing) and gaining weight, as students appear to be an *at-risk* population.

It is important to remember that not all students are exposed, or respond in the same way, to the stressors associated with higher education, some students may encounter fewer challenges and changes when attending university (e.g. remaining in the family home), which can result in less unhealthy lifestyle behaviours (Kremmyda et al., 2008). There are challenges, however, that will inevitably be present (e.g. academic work). Some students do not adopt less healthy lifestyles despite being in similar environments and manage to effectively cope with, or even thrive off, the transition to university life and remain in control of their lifestyle choices. For

example, some students maintain or increase their physical activity levels (Bray & Born, 2004) and not gain weight (Vadeboncoeur et al., 2015). Therefore, how students perceive their environment and view barriers, as well as their ability to cope with the stressors, may influence whether students are able to adopt or maintain healthy lifestyle behaviours. Some students may see moving away from home as a threat and difficulty, whereas others may view it as an opportunity to learn new skills. Individual differences may play an important role in student's weight changes during their time in higher education (Finlayson et al., 2012), this study aims to understand the extent that MT can impact HRLF amongst students.

Mental Toughness in Education

MT research focusing on university students is in its infancy with limited attention, however, it is a construct reported to have a beneficial impact within an educational setting (e.g., Crust, Earle, et al., 2014). Gucciardi et al. (2015) reported MT was associated with academic and social goal progress at college level. However, it was not clear whether objective or subjective goals were set, and students assessed their own goal progress which may have led to unreliable results. Additionally, the low MT students may naturally set less challenging goals, due to their greater fear of failure and lower challenge component (Clough & Strycharczyk, 2012). Crust et al. adopted more standardised measures, and reported a higher MT was associated with better first-year grades and increased likelihood of progress from first to second year. MT has also been positively associated with attendance and attainment, and negatively associated with counterproductive classroom behaviours amongst high school students (St Clair-Thompson, Bugler, Robinson, Clough, McGeown & Perry, 2014). Therefore, academic success appears to be

influenced by variables wider than academic ability (e.g., psychological characteristics).

Findings in relation to university students' achievement may be transferable, and benefit their health-related lifestyle behaviours. Crust, Earle, et al (2014) identified higher grades and progression of studies was predicted by interpersonal confidence, which may encourage students to seek help when unsure. Seeking help and support is associated with a lower level of distress (Ryan, Shochet & Stallman, 2010), thus may protect psychological wellbeing. Students seeking help may extend beyond academic benefits, and expand to gaining information in areas such as physical activity or cooking skills. This indicates the potential importance of MT outside of academic ability in university students.

As discussed in Chapter Two (Direct Relationships between Mental Toughness and Health Related Lifestyle Factors, p. 72), MT has been positively associated with physical activity and life satisfaction (Gerber et al., 2012; Gerber et al., 2013), and negatively related to stress levels (Gerber et al., 2013). Therefore, based on such research the current study will extend this line of enquiry into MT and HRLF that can influence a student's weight, as well as address shortcomings of previous work. For example, Gerber et al. (2013) utilised the MTQ48 to assess MT, but only assessed overall MT in relation to the variables such as life satisfaction. Thus, it was not clear which components have a greater relationship with MT, and which MT components could be targeted to enhance life satisfaction. Therefore, the present study will ensure all components of MT are assessed individually.

The current study incorporates both physical and psychological variables, which creates a more holistic interpretation of the effects of the university environment on the individual's health. Physical activity, dietary behavior, and

psychological wellbeing, appear influential on student's weight whilst at university through both direct (e.g., less physical activity can result in weight gain) and indirect (e.g., stress can cause less healthy dietary choices, which can lead to weight gain) pathways. While attending university, students have the challenge of balancing temptation and distraction and remaining in control and committed towards leading a healthy lifestyle. Such characteristics are reflective of those reported amongst high mentally tough footballers (Cook et al., 2014). Additionally, mentally tough individuals would be expected to circumnavigate barriers to healthy lifestyle behaviours due to their more effective coping mechanisms (e.g., problem focused coping) and coping self-efficacy (Nicholls et al., 2011). Mentally tough individuals are less likely to use avoidance coping mechanisms and resign from a task, as well as more likely to create a clear plan (Kaiselar et al., 2009), be confident, and view changes as a chance to develop and not as a threat (Strycharczyk & Clough et al., 2015).

Research Aim

The first study in this thesis aimed to examine the relationships between MT and HRLF. Specifically, the variables assessed in relation to MT were exercise levels, exercise barriers, eating identity, and psychological wellbeing amongst undergraduate university students. Examining these relationships could aid in identifying students at risk of leading an unhealthy lifestyle, future researchers can then develop targeted interventions to enhance MT which may help to protect physical and psychological health. Furthermore, exploring the relationships would expand the current understanding of MT and the potential role it may play in influencing health related lifestyle behaviors. The current study had three hypotheses:

1. University students with a greater MT score will report significantly weaker barriers to exercise, and higher exercise levels.
2. University students with a greater MT score will report significantly healthier eating identities.
3. University students with a higher MT score will report a significantly greater psychological wellbeing.

Method

Research Design

This study followed a cross-sectional research design, it offered a snapshot of the sample of interest to explore the subject area (Jupp, 2006). The method involved measuring the independent variable (MT) and dependent variables (physical activity levels, exercise barriers, dietary behaviours, and psychological wellbeing) at a single point in time (VanderStoep & Johnston, 2009). The use of the analytic survey enables statistical models to be applied to the data (Jupp, 2006).

Participants

The study involved 167 undergraduate university students (44 males, 123 females) studying in the UK at one of nine institutions. Participants' age ranged between 18 – 40 years (M = 20.79 ± 3.38 years). The majority of the sample was White British; approximately 5% were other ethnicities including Sri Lankan, Zimbabwean, and French. Most students were studying sport or psychology; however, a diverse range of courses were involved including fashion and design, history, and biology. The sample consisted of 63 first year students, 44 second year students, and 60 third year students, of whom 77% had moved away from their home to attend university.

Instruments

An anonymous online questionnaire was distributed using Qualtrics, which is a password protected software package that ensures data is securely protected to adhere to industry standards (Qualtrics, 2013). An anonymous online questionnaire was selected due to significantly decreased social desirability and social anxiety associated over a non-anonymous paper version (Joinson, 1999). The questionnaire consisted of demographic questions, followed by published questionnaires to measure all variables (Appendix C – G). An outline of each section of the questionnaire is provided below in the order that they were administered. A deeper outline of the measures, and statistical properties, were discussed in the methods of investigation in the literature review (Methods to Investigating Mental Toughness, p. 38; Methods to Investigate Health-Related Lifestyle Factors and Weight Loss, p. 50).

Demographic information. Background questions were created by the researcher. These questions captured sociodemographic information about the participant. Data such as year of study, course being studied, changes in physical activity, and whether students had moved away from home, were recorded.

Mental toughness. The MTQ48 (Clough et al., 2002; Appendix C) was used to assess MT and takes under ten minutes to complete. This questionnaire consisted of 48 items, which participants responded to on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The instrument provides an overall MT score and a score for the six subcomponents that were outlined in Chapter One. Example statements include: “I don’t usually give up under pressure” (commitment); “challenges usually bring out the best in me” (challenge); “I usually take charge of a situation when I feel it is appropriate” (interpersonal confidence); “I am generally confident in my abilities” (confidence in abilities); “I generally feel in control” (life

control); “even when under considerable pressure I usually remain calm” (emotional control). As discussed in the previous chapter the MTQ48 is a well-supported instrument to assess MT.

Exercise barriers. The exercise barrier scale from the Exercise Benefits and Barriers Scale instrument (EBBS; Sechrist et al., 1987; Appendix E) assessed participants’ barriers to exercise, and takes less than five minutes to complete. The questionnaire assessed four exercise barriers, as discussed in Chapter Two (a) exercise milieu (barriers created by the environment and surroundings), (b) physical exertion (physical pain is a deterrent from exercise), (c) time expenditure (time constraints inhibit exercise participation), and (d) family discouragement (barriers imposed due to family influences and responsibility). Participants rated the 14 items that describe potential barriers to exercise on a 4-point Likert scale, ranging from 1 (strongly agree) to 4 (strongly disagree), which provide scores for the strength of each component and overall exercise barriers. Example statements include: “Exercise tires me” (physical exertion); “Exercise takes too much of my time” (time expenditure); “My family members do not encourage me to exercise” (family discouragement); “Exercise facilities do not have convenient schedules for me” (exercise milieu). Higher scores represented a weaker barrier to exercise.

Self-reported physical activity. Initially the International Physical Activity Questionnaire (IPAQ; Craig et al., 2003; Appendix D), which takes approximately five minutes to complete, was used to record self-reported physical activity. The questionnaire provides a score for time spent doing moderate activity, time spent doing vigorous activity, and time spent sitting. Following reliability issues with the IPAQ, one of the demographic questions was used instead; thus, in the present study a regular exerciser was defined as an individual who exercises at a moderate to

vigorous intensity to maintain or improve health/fitness at least three times a week. This was measured as a binary variable.

Eating identity. Eating identity was assessed using the Eating Identity Type Inventory (EITI; Blake et al., 2013; Appendix F). The 12 statements assess the strength of four eating identities (a) healthy (being selective over food ensuring it is nutritional), (b) emotional (consuming food when feeling sad or stressed, or excessive amounts of food), (c) meat (consuming meat), and (d) picky (a restrictive diet which rarely incorporates new foods). The 12 statements were rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), thus a higher score represents a greater affinity to the eating identity being assessed. The questionnaire takes less than five minutes to complete, example statements include: "you are someone who eats in a nutritious manner" (healthy eating identity); "you are someone who eats more when stressed or anxious" (emotional eating identity); "you are someone who likes meat with every meal" (meat eating identity); and "you are someone who likes to try new foods" (picky eating identity).

Psychological wellbeing. The Scales of Psychological Wellbeing (SPWB; Ryff, 1989; Appendix G) assessed how the individual feels about them self and their life, and takes about ten minutes to complete. The instrument consists of six components (a) self-acceptance (positive evaluations of oneself and one's past life), (b) personal growth (sense of development and continued growth as an individual), (c) purpose in life (belief that one's life is meaningful), (d) positive relations with others (existence of meaningful relationships with others), (e) environmental mastery (capacity to effectively manage one's life and the surrounding world), and (f) autonomy (a sense of self-determination). The current study used the middle length version (54 items) as opposed to the long (84 items) or short version (nine items).

This was selected due to the strong relationship between the selected version and the long version, whilst keeping the completion time to a minimum. The 54 statements were responded to on a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). Each statement assessed one of the six subcomponents of psychological wellbeing, example statements include; "my decisions are not usually influenced by what everyone else is doing" (autonomy); "in general I feel that I am in charge of the situation in which I live" (environmental mastery); "I think it is important to have new experiences that challenge how you think about yourself and the world" (personal growth); "People would describe me as a giving person, willing to share my time with others" (positive relations with others); "I sometimes feel as if I've done all there is to do in life" (purpose in life); "I like most aspects of my personality" (self-acceptance).

Procedure

Ethical approval from the university ethics committee was granted for this study. The main considerations were confidentiality and the leakage of the participants' data; thus, all data was stored on a password protected computer. The minimum amount of personal data was collected for the purpose of this study (e.g., e-mail address). Lecturers known to the research team were contacted via e-mail. The e-mail explained the background and the importance of the current study along with a link to the online questionnaire (Appendix A), all contacted staff agreed to distribute the information and link to students in their own department. The e-mail purposely provided a brief outline of the study, explaining it was to explore the psychological characteristics and lifestyle choices of students, this was to reduce socially desirable responses and avoid a biased sample; for example, being more appealing to students who regularly exercise. The link was distributed to all students

via e-mail and virtual learning environments (e.g., BlackBoard, ebridge), this ensured all students had an equal opportunity to participate. Students willing to participate followed a hyper-link to complete the questionnaire, if participants did not wish to partake, the e-mail could be ignored. Prior to questionnaire completion, informed consent was obtained and participants were aware of their right to withdraw without reason, and that their data would be treated confidentially and anonymously. Staff were from a range of departments and institutions, resulting in students from nine universities being represented in the current study. The self-paced questionnaire, as outlined in the procedures section, took approximately 25 minutes to complete. The participants completed the questionnaire at a time and place of their convenience. Data collection occurred half way through the academic year, which ensured that the students were familiar with, and had an experience of, their current academic year of study. Following completion of the questionnaire an online written debrief was provided, which outlined the nature of the experiment and the contribution that the study could have to current literature, as well as the contact details of the lead researcher should the participant have any questions.

Data analysis

Data analysis was conducted on SPSS version 22. Data was initially screened for outliers and missing variables using the ± 2.5 mean absolute deviation approach, which is equivalent to testing three standard deviations from the median (Leys, Ley, Klein, Bernard & Licata (2013). This is a more effective than using the typical ± 3 standard deviation method, as it does not use outliers to calculate the deviation. Values classed as an outlier (1.1% of all cases) were deleted (Leys et al., 2013). Mean, standard deviation, kurtosis, and skewness of variables were calculated prior to proceeding with further statistical analysis. Cronbach's alpha was used to assess

the internal consistency of the questionnaires. Pearson's bivariate correlation explored the relationships between MT and health related lifestyle variables. Hierarchical multiple linear regression (enter method) examined the predictive value of MT on the measured variables, whilst controlling for gender and year of study. Hierarchical regression is the most suitable method when controlling for other factors (i.e., gender and year of study; Field, 2009), as well as when the predictor variables entered are correlated with each other (Pedhazur, 1997). The data met the assumptions of hierarchical linear regression (i.e., data were normally distributed, was on an interval scale, and did not display multicollinearity; Field, 2009). Scores of ten (sten scores; Clough & Strycharczyk, 2012), based upon previously established normative data, were used to compare the MT of the current sample to the population.

Results

Testing for Normality, Outliers, and Internal Consistencies

No missing data was evident. Tests of univariate normality found all data were within standard limits of kurtosis and skewness (< 2). Descriptive statistics are displayed in Table 3.1 to 3.4. Subscales of MT had good internal consistency (α = .72 to 92) with the exception of emotional control (α = .46) and life control (α = .69). Life control internal consistency was deemed to be at the lower end of acceptability. Interim correlation matrix was examined to identify troublesome items of the emotional control subscale. Negative correlations were identified between items 26 and 34, which is in line with previous research (Perry et al., 2013), and resulted in the removal of these items. The five remaining components had a Cronbach's alpha of .58 and were used as a measure of emotional control in all proceeding analyses. All exercise barrier scales presented good internal consistency (α = .77 to .81) with

the exception of family discouragement, which was approaching an acceptable reliability (α = .57). The eating identity scales displayed good reliability (α = .81 to .90) with the exception of meat eating identity (α = .56). Blake et al. (2013) identified item three to be problematic in this scale, which was also reported in the current study following interim correlation matrix. The remaining items were used as a measure of meat eating identity in all preceding analyses (α = .73). All subscales of the psychological wellbeing questionnaire displayed good reliability (α = .75 to .85).

Descriptive Statistics

Table 3.1

Differences between Regular and Non-Regular Exercisers' Mental Toughness

	Variable	Regular exercisers (*n* = 94; 56%) (*M* ± *SD*)	Non-regular exercisers (*n* = 73; 44%) (*M* ± *SD*)
MT (Scale 1 – 5)	Overall MT	3.43 ± .42	3.24 ± .54*
	Challenge	3.57 ± .54	3.47 ± .59
	Commitment	3.57 ± .52	3.36 ± .64*
	Emotional control	2.91 ± .65	2.78 ± .74
	Life control	3.49 ± .46	3.38 ± .68
	Confidence in abilities	3.24 ± .64	2.98 ±.74*
	Interpersonal confidence	3.62 ± .66	3.36 ± .81*
EBBS (Scale 1 – 4)	Overall barriers	3.22 ± .58	2.67 ± .52***
	Exercise milieu	3.31 ± .58	2.73 ± .52***
	Physical exertion	2.70 ± .78	2.21 ± .68***
	Time expenditure	3.40 ± .59	2.79 ± .80***
	Family discouragement	3.43 ± .62	3.01 ± .69***

Note. A higher MT score represents a higher MT (measured on a continuous scale of 1-5), a higher exercise barrier score represents a weaker barrier (measured on a continuous scale of 1-4). * Statistically significant at $p < 0.05$; **statistically significant at $p < 0.01$; *** statistically significant at $p < 0.001$.

The mean MT of the current student sample ((*n* = 167) was 3.35 ± .48. Converting the MT to a sten score displayed MT to be significantly lower (*M sten* = 4.03; $p < .01$) than that of the general population (*M sten* = 5.5). Regular exercisers overall MT (*M* = 3.43 ± .42) was significantly higher than non-regular exercisers MT (*M* = 3.24 ± .54, $p < .05$). The regular exercisers reported significantly weaker total barriers to exercise (*M* = 3.22 ± .58) than non-regular exercisers (*M* = 2.67 ±.52, $p < .001$). Nearly one third (31%) of the sample reported a reduction in exercise levels after starting university. Average values and standard deviations for all measured variables are displayed in the tables below (Table 3.1 – 3.3).

Bivariate Correlations

The relationships between MT components and measured variables of HRLF were investigated, using Pearson's bivariate correlation between MT and each of the dependent variables (Table 3.2 – 3.4).

Mental toughness and exercise. Overall MT displayed significant relationships with all exercise barriers ($r = .18$ to .34, $p < 0.05$), which were positive and around a moderate strength. The strongest relationships existed between exercise milieu and life control ($r = .37$, $p < .01$), exercise milieu and confidence in abilities ($r = .35$, $p < .01$), and confidence in abilities with both physical exertion ($r = .27$, $p < 0.01$) and time expenditure ($r = .27$, $p < 0.01$), which displayed significant positive moderate relationships.

Mental toughness and eating identity. Overall MT was significantly correlated with healthy eating identity ($r = .16$, $p < .05$) and picky eating identity ($r = -.15$, $p < .05$). Significant correlations displayed a weak to moderate correlation ($r = -.16$ to .24, $p < 0.05$). The strongest relationships existed between healthy eating identity and life control ($r = .24$, $p < .01$), healthy eating identity and confidence in

Table 3.2

Descriptive Statistics, Normality Estimates, (Internal Consistency Coefficient), and Bivariate Correlations between Mental Toughness Exercise Barriers

Variable	M ± SD	Z Skew	Z Kurt	1	2	3	4	5	6	7	8	9	10	11	12
Overall MT (1)	3.35 ± .48	-.70	1.26	(.92)											
Challenge (2)	3.53 ± .56	-.47	.45	.78**	(.72)										
Commitment (3)	3.48 ± .58	-.50	.55	.80**	.55**	(.80)									
Emotional control (4)	2.85 ± .69	-.05	-.38	.73**	.60**	.42**	(.58)								
Life control (5)	3.44 ± .57	-.78	1.67	.80**	.49**	.64**	.46**	(.69)							
Confidence in abilities (6)	3.13 ± .69	-.43	.02	.85**	.55**	.56**	.63**	.69**	(.84)						
Interpersonal confidence (7)	3.51 ± .74	-.46	-.03	.60**	.40**	.31**	.37**	.37**	.38**	(.76)					
Total barriers (8)	2.98 ± .54	-.03	-.52	.35**	.21**	.27**	.18*	.35**	.38**	.16*	(.87)				
Exercise milieu (9)	3.07 ± .61	-.22	-.40	.34**	.21**	.28**	.16*	.37**	.35**	.16*	.89**	(.77)			
Physical exertion (10)	2.35 ± .66	.17	-.41	.27**	.19*	.26**	.19*	.20*	.27**	.06	.67**	.44**	(.77)		
Time expenditure (11)	3.13 ± .75	-.93	.60	.18*	.08	.08	.06	.20**	.27**	.13	.79**	.61**	.30**	(.81)	
Family discouragement (12)	3.26 ± .66	-.48	.55	.22**	.13	.16*	.13	.24**	.23**	.14	.65**	.43**	.31**	.53**	(.57)

Note. * Statistically significant at $p < 0.05$. **Statistically significant at $p < 0.01$.

Table 3.3

Descriptive statistics, Normality Estimates, (Internal Consistency Coefficient), and Bivariate Correlations between Mental Toughness and Eating Identity

Variable	M ± SD	Z Skew	Z Kurt	1	2	3	4	5	6	7	8	9	10	11
Overall MT (1)	3.35 ± .48	-.69	1.24	(.92)										
Challenge (2)	3.53 ± .56	-.47	.45	.78**	(.72)									
Commitment (3)	3.48 ± .58	-.50	.52	.80**	.55**	(.80)								
Emotional control (4)	2.85 ± .69	-.05	-.38	.73**	.60**	.42**	(.58)							
Life control (5)	3.44 ± .57	-.78	1.67	.80**	.49**	.64**	.46**	(.69)						
Confidence in abilities (6)	3.13 ± .69	-.43	.01	.85**	.55**	.56**	.63**	.69**	(.84)					
Interpersonal confidence (7)	3.51 ± .74	-.46	-.03	.60**	.40**	.31**	.37**	.37**	.38**	(.76)				
Healthy (8)	3.23 ± 1.16	-.28	-.82	.16*	.06	.18*	-.01	.24**	.20*	.17*	(.90)			
Emotional (9)	3.03 ± 1.19	.02	-.96	-.05	.02	-.06	-.01	-.03	-.09	-.01	-.15	(.81)		
Meat (10)	3.14 ± 1.25	-.28	-.89	.04	.10	.13	.04	-.04	-.04	-.02	-.07	-.06	(.73)	
Picky (11)	3.58 ± 1.24	.45	-.97	-.16*	-.17*	-.12	-.01	-.19*	-.14	-.06	-.42**	-.11	-.22**	(.84)

Note. * Statistically significant at $p < 0.05$. **Statistically significant at $p < 0.01$.

Table 3.4

Descriptive Statistics, Normality Estimates, (Internal Consistency Coefficients), and Bivariate Correlations between Mental Toughness and Psychological Wellbeing

Variable	M ± SD	Z Skew	Z Kurt	1	2	3	4	5	6	7	8	9	10	11	12	13
Overall MT (1)	3.35 ± .48	-.70	1.26	(.92)												
Challenge (2)	3.53 ± .56	-.47	.45	.78**	(.72)											
Commitment (3)	3.48 ± .58	-.50	.55	.80**	.55**	(.80)										
Emotional control (4)	2.85 ± .69	-.05	-.38	.73**	.60**	.42**	(.58)									
Life control (5)	3.44 ± .57	-.78	1.67	.80**	.49**	.64**	.46**	(.69)								
Confidence in abilities (6)	3.13 ± .69	-.43	.02	.85**	.55**	.56**	.63**	.69**	(.84)							
Interpersonal confidence (7)	3.51 ± .74	-.46	-.03	.60**	.40**	.31**	.37**	.37**	.38**	(.76)						
Autonomy (8)	4.08 ± .75	-.36	.28	.58**	.37**	.44**	.38**	.41**	.45**	.62**	(.75)					
Environmental mastery (9)	4.20 ± .77	-.73	.92	.74**	.48**	.70**	.47**	.67**	.66**	.30**	.35**	(.77)				
Personal growth (10)	4.74 ± .72	-.79	.51	.51**	.49**	.52**	.27**	.39**	.42**	.16*	.34**	.50**	(.77)			
Positive relations with others (11)	4.45 ± .89	-.72	.29	.50**	.32**	.38**	.29**	.42**	.52**	.31**	.22**	.59**	.48**	(.81)		
Purpose in life (12)	4.55 ± .75	-.70	.71	.55**	.35**	.64**	.17*	.57**	.44**	.20*	.29**	.69**	.61**	.41**	(.78)	
Self-acceptance (13)	4.11 ± .94	-.63	.15	.73**	.47**	.56**	.46**	.62**	.77**	.36**	.45**	.69**	.51**	.63**	.55**	(.85)

Note. * Statistically significant at $p < 0.05$. **Statistically significant at $p < 0.01$.

abilities (r = .20, p < .05), and picky eating identity and life control (r = -.19, p < .05), which displayed significant positive weak relationships.

Mental toughness and psychological wellbeing. Overall MT was significantly correlated with all psychological wellbeing scales (r = .51 to .74, p < 0.01). Individual MT components were significantly related to psychological wellbeing scales (r = .17 to .77, p < 0.05). The strongest relationships existed between self-acceptance and confidence in abilities (r = .77, p < .001), environmental mastery and life control (r = .67, p < .001), and purpose in life and commitment (r = .64, p < .001), which displayed significant positive moderate to strong relationships.

Hierarchical Multiple Linear Regressions

Additional data analyses included a series of hierarchical multiple linear regressions (Table 3.5 – 3.7). There was no multicollinearity evident in the data as all the predictor variables had a Variance Inflation Factor (VIF) of less than 10 (1.30 – 2.63; Myres, 1990), and the collinearity tolerance statistic exceeded .20 (.38 -.78; Menard, 1995). Each lifestyle behaviour was separately inserted as a dependent variable in separate analyses. At step one, gender and year of study were entered. The MT subscales were entered at step two.

Mental toughness and exercise. All exercise barriers were significantly predicted by at least one MT component, with the exception of family discouragement. The variance in exercise barriers significantly predicted by MT ranged from 10% to 18%. Overall barriers to exercise was positively predicted by confidence in abilities (β = .34, p < .01), and negatively predicted by emotional control (β = -.23, p < .05). Exercise milieu was negatively predicted by emotional control (β = -.24, p < .05),

Table 3.5

Hierarchical Multiple Linear Regression Analyses for Exercise Barriers with Mental Toughness

Variable	Step 1 Year of study, gender	Step 2 Components of MT
Exercise milieu	Adj R^2 = .03*, *F* (2, 164) = 3.66* Gen β = -.10, YOS β = -.17*	ΔR^2 = .18.1***, *F* (8, 158) = 5.71*** Chl β = .06, Com β = .07, Emo β = -.24*, Life β = .22*, Abl β = .26*, Int = .01
Physical exertion	Adj R^2 = .02 *F* (2, 164) = 2.80 Gen β = -.12, YOS β = -.13	ΔR^2 = .10**, *F* (8, 158) = 2.95** Chl β = .05, Com β = .20, Emo β = -.06, Life β = .06, Abl β = .23, Int = -.07
Time expenditure	Adj R^2 = .03*, *F* (2, 164) = 3.21* Gen β = -.15, YOS β = -.10	ΔR^2 = .12**, *F* (8, 158) = 1.84** Chl β = .03, Com β = -.11, Emo β = -.29**, Life β = .10, Abl β = .39**, Int β = .05
Family discouragement	Adj R^2 = -.01, *F* (2, 164) = .18 Gen β = -.04, YOS β = -.02	ΔR^2 = .07, *F* (58, 158) = 1.47 Chl β = -.01, Com β = -.01, Emo β = -.06, Life β = .15, Abl β = .15, Int β = .05
Overall barriers	Adj R^2 = .04*, *F* (2, 164) = 4.25* Gen β = -.14, YOS β = -.16*	ΔR^2 = .18***, *F* (8, 158) = 5.84*** Chl β = .05, Com β = .06, Emo β = -.23*, Life β = .15, Abl β = .34**, Int β = -.01

Note. Adj R^2 = Adjusted R^2, ΔR^2 = change in R^2, Gen = gender, YOS = year of study, Chl = challenge, Com = commitment, Emo = emotional control, Life = Life control, Abl = confidence in abilities, Int = interpersonal confidence.
* Statistically significant at $p < 0.05$. **Statistically significant at $p < 0.01$. *** Statistically significant at $p < 0.001$.

Table 3.6

Hierarchical Multiple Linear Regression Analyses for Eating Identity with Mental Toughness

Variable	Step 1 Year of study, gender	Step 2 Components of MT
Healthy	Adj R^2 = .03, *F* (2, 164) = 3.52*	ΔR^2 = .09*, *F* (8, 158) = 3.06**
	Gen β = .13, YOS β = .14	Chl β = -.09, Com β = .07, Emo β = -.16, Life β = .15, Abl β = .16, Int β = .14
Emotional	Adj R^2 = -.00, *F* (2, 164) = .86	ΔR^2 = .02, *F* (8, 158) = .65
	Gen β = .02, YOS β = -.10	Chl β = .12, Com β = -.09, Emo β = .02, Life β = .07, Abl β = -.17, Int β = .14
Meat	Adj R^2 = .03, *F* (2, 164) = .2.46	ΔR^2 = .05*, *F* (8, 158) = 1.74
	Gen β = .01, YOS β = .17*	Chl β = .09, Com β = .21*, Emo β = .11, Life β = -.13, Abl β = -.16, Int β = -.06
Picky	Adj R^2 = .06**, *F* (2, 164) = 6.00**	ΔR^2 = .05, *F* (8, 158) = 2.72**
	Gen β = -.07, YOS β = -.24**	Chl β = .17, Com β = .07, Emo β = .13, Life β = -.20, Abl β = -.04, Int β = .04

Note. Adj R^2 = Adjusted R^2, ΔR^2 = change in R^2, Gen = gender, YOS = year of study, Chl = challenge, Com = commitment, Emo = emotional control, Life = Life control, Abl = confidence in abilities, Int = interpersonal confidence.

* Statistically significant at $p < 0.05$. **Statistically significant at $p < 0.01$. *** Statistically significant at $p < 0.001$.

Table 3.7

Hierarchical Multiple Linear Regression Analyses for Psychological Wellbeing with Mental Toughness

Variable	Step 1 Year of study, gender	Step 2 Components of MT
Autonomy	Adj R^2 = .01, *F* (2, 164) = 1.69 Gen β = -.14, YOS β = .05	ΔR^2 = .45***, *F* (8, 158) = 17.70*** Chl β = -.05, Com β = .22**, Emo β = .03, Life β = .00, Abl β = .14, Int = .51***
Environmental mastery	Adj R^2 = -.01 *F* (2, 164) = .03 Gen β = -.01, YOS β = -.02	ΔR^2 = .62***, *F* (8, 158) = 32.04*** Chl β = -.02, Com β = .42***, Emo β = -.05, Life β = .21**, Abl β = .27**, Int = -.00
Personal growth	Adj R^2 = -.00, *F* (2, 164) = .86 Gen β = -.00, YOS β = .10	ΔR^2 = .35***, *F* (8, 158) = 11.08*** Chl β = .34***, Com β = .32***, Emo β = -.15, Life β = .00, Abl β = .19, Int = -.10
Positive relations with others	Adj R^2 = -.00, *F* (2, 164) = .69 Gen β = .09, YOS β = -.01	ΔR^2 = .32***, *F* (8, 158) = 9.44*** Chl β = -.00, Com β = .09, Emo β = -.08, Life β = .03, Abl β = .46***, Int = .15*
Purpose in life	Adj R^2 = -.01, *F* (2, 164) = .36 Gen β = -.16, YOS β = .62	ΔR^2 = .48***, *F* (8, 158) = 18.83*** Chl β = .05, Com β = .47***, Emo β = -.27**, Life β = .30**, Abl β = .12, int β = -.03
Self-acceptance	Adj R^2 = .00, *F* (2, 164) = 1.22 Gen β = -.03, YOS β = .12	ΔR^2 = .62***, *F* (8, 158) = 34.69*** Chl β = .00, Com β = .13*, Emo β = -.05, Life β = .09, Abl β = .65***, int β = .06

Note. Adj R^2 = Adjusted R^2, ΔR^2 = change in R^2, Gen = gender, YOS = year of study, Chl = challenge, Com = commitment, Emo = emotional control, Life = Life control, Abl = confidence in abilities, Int = interpersonal confidence. Adjusted R

* Statistically significant at p < 0.05. **Statistically significant at p < 0.01. *** Statistically significant at p < 0.001.

and positively predicted by confidence in abilities (β = .26, p < .05), and life control (β = .22, p < .05). Commitment was approaching significance as a predictor of physical exertion (β = .20, p = .06). Time expenditure was positively predicted by confidence in abilities (β = .39, p < .05) and negatively predicted by emotional control (β = -.29, p < .01). Despite being significantly related to MT, family discouragement was not significantly predicted by any individual MT components.

Mental toughness and eating identity. The variance in eating identity subscales explained by MT ranged from 5 to 9%. MT significantly predicted healthy eating identity (β = .09, p < .05) and meat eating identity (β = .05, p < .01). On closer analysis commitment was the most significant predictor of meat eating identity (β = .21, p < .05). None of the individual MT components significantly predicted healthy eating identity.

Mental toughness and psychological wellbeing. The variance in psychological wellbeing subscales explained by MT ranged from 32 to 62%. Autonomy positively predicted by commitment (β = .22, p < .01), and interpersonal confidence (β = .51, p < .001). Environmental mastery was positively predicted by commitment (β = .42, p < .001), life control (β = .21, p < .01), and confidence in abilities (β = .27, p < .01). Personal growth was positively predicted by challenge (β = .34, p < .001), and commitment (β = .32, p < .001). Positive relations with others was positively predicted by confidence in abilities (β = .46, p < .001), and interpersonal confidence (β = .15, p < .05). Purpose in life was positively predicted by commitment (β = .47, p < .001), and life control (β = .27, p < .01), and negatively predicted by emotional control (β = -.27, p < .01). Self-acceptance was positively predicted by commitment (β = .13, p < .05), and confidence in abilities (β = .65, p < .01).

Discussion

The primary aim of this study was to evaluate the relationships between MT and HRLF amongst undergraduate students. Specifically, the relationships between MT and perceived barriers to exercise, self-reported physical activity, eating identity, and psychological wellbeing were explored. In doing so, the first research objective of this thesis was addressed. Several important findings emerged that were consistent with the prediction that MT would be related to leading a healthy lifestyle, which may aid in protecting students against weight gain (Finlayson et al., 2012). The present findings, alongside recent work (Crust, Earle, et al., 2014), highlight the importance of MT in higher education. In light of the current obesity epidemic and concerning changes in lifestyle behaviour (WHO, 2016; PHE, 2016), as well as the stressors associated with attending university (Mackaskill et al., 2013), exploring correlates which can aid in protecting physical and psychological health is appropriate. The research can increase the understanding of how MT can enhance HRLF, which can protect one's health and enable individuals to flourish. Each hypothesis will be addressed in the following three sections.

Hypothesis One: Mental Toughness and Exercise

In support of hypothesis one, MT was significantly greater amongst regular exercisers compared to non-regular exercisers. Students who had a higher MT had significantly weaker barriers to exercise. Therefore, participants with lower MT perceived stronger barriers to exercise and thus perceived greater obstacles to overcome, and were less physically active. Nearly one third of the current sample reported decreased exercise levels since starting university, which is similar to previous statistics (Bray & Born, 2004). The reduction in exercise levels amongst

some university students highlights the importance of personal resources in overcoming perceived exercise barriers.

Students who participated in regular exercise reported significantly higher MT than those who did not. This is congruent with previous work that found differences in MT between high school students who reported no days, as opposed to three or more days of vigorous physical activity per week (Gerber et al., 2012). While Gerber et al. (2012) highlighted differences in coping as one potential explanation for their results, findings in the present study indicate the importance of students' perceptions. This is in line with previous research that has shown high mentally tough individuals held different perceptions during challenging situations, compared to individuals with lower mental toughness scores (Clough et al., 2002; Levy et al., 2006).

As anticipated, regular exercisers perceived significantly weaker barriers to exercise than non-regular exercisers. The associated cost of the behaviour (i.e. barriers to exercise) relating to actual behaviour (i.e. exercise) is congruent with the HBM. The strongest barrier reported in the current study was physical exertion (hard work, associated fatigue), which is consistent with a previous study of non-exercising female UK university students (Lovell et al., 2010).

Theoretically, the relationships between MT and exercise barriers are important, given the role of perceived barriers in predicting actual behaviour in the HBM. The present study highlights that MT is one influential individual difference in determining how barriers are perceived, and in turn might influence actual behaviour. Therefore, targeting MT could influence perceived barriers and would impact actual behaviour. All barriers were significantly related to MT, the barrier exercise milieu (environmental factors) was found to be most strongly predicted by

MT (accounting for 19% of the variance). Life control and confidence in abilities were most strongly related to exercise milieu, which appear logical considering the two components of MT are significantly related to optimism (Clough et al., 2002). This may enable the students to view their environment more positively, as an opportunity to be physically active rather than perceiving numerous exercise barriers.

Confidence in abilities was also the strongest predictor of the barrier time expenditure. This is congruent with previous work reporting that confidence in abilities is related to planning and logical analysis, which enables the individual to organise their time and transform perceived unmanageable events to appear manageable (Nicholls et al., 2008). Confidence in abilities is related to the construct of self-efficacy (Strycharczyk & Clough 2015), which was previously reported to decrease from college to university due to other challenges taking priority, for example assignments (Van Dyck et al., 2015). Thus, having confidence to handle multiple stressors, reflected by Nicholls et al. (2015) work that reported coping self-efficacy was positively related to MT, may enhance physical activity levels. Furthermore, Crust, Swann, et al. (2014) found mentally tough exercisers prioritised exercise, organised their time effectively, and made sacrifices to ensure exercise goals were achieved, which again demonstrated the high MT individuals could manage their time more effectively.

Physical exertion was the strongest barrier to exercise for the low mentally tough individuals, indicating it is an important barrier to address. The significant positive relationship between MT and physical exertion demonstrates the pain of exercise acts as a deterrent to low mentally tough individuals. This is congruent with Crust and Clough (2005) who reported that low MT was associated with lower

muscular endurance, potentially attributable to lower emotional control in terms of dealing with the pain. Crust, Swann, et al. (2014) reported mentally tough exercisers to exhibit high volumes and intensity of training, enjoy punishing training schedules, and associated exercise pain positively as an indication of working hard. In contrast, the low mentally tough students may perceive the pain of exercise as negative and punishing as opposed to rewarding and resembling hard work. The perceived pain may deter the low mentally tough individuals from exercising, due to their greater reward sensitivity than high mentally tough individuals (Hardy et al., 2013). Potentially, less painful exercise or transforming perception of pain to be rewarding and a sign of working hard would benefit low mentally tough individuals. In addition, Levy et al. (2006) identified commitment to be significantly and positively correlated with pain-tolerance, and negatively associated with pain catastrophising during sports rehabilitation. Commitment being a key component in relation to exercise barriers reflects previous research that found conscientiousness, which is significantly related to commitment, to be a significant predictor of physical activity (Rhodes & Smith, 2006).

Despite family discouragement being significantly predicted by MT there were no individual components which were significant predictors, however this was found to be the weakest barrier to exercise. This is feasible considering 77% of the sample moved away from the family home to attend university, thus their family may be less influential. Therefore, family discouragement appears a less important barrier to exercise to address amongst university students.

Hypothesis Two: Mental Toughness and Eating Identity

In support of hypothesis two, MT was significantly related to healthier dietary characteristics. Healthy eating identity is related to increased fruit and

vegetable consumption and decreased dietary fat consumption, and a lower picky eating identity is associated with increased fruit and vegetable consumption and greater dietary fibre intake (Blake et al., 2013). These relationships between MT and healthier dietary characteristics appear logical.

Life control emerged as an important component of MT, which was negatively related to picky eating identity, and was the most strongly related MT component to healthy eating identity. Life control being a key contributor towards dietary consumption may explain previous barriers to healthy eating, such as readily available food in catered accommodation and accessible junk food in student halls (Levitsky et al., 2004), as students need to be in control of their choices to overcome the temptations in their environment. Resisting temptation has previously been reported as a characteristic amongst mentally tough footballers (Cook et al., 2014). Factors such as the ability to resist desires enhance self-control of female dieting students, to enable more favourable eating behaviours (Lopez et al., 2015).

Healthy eating identity was significantly related to confidence in abilities, which is a correlate of coping self-efficacy (Nicholls et al., 2011). Greater coping self-efficacy can reduce the student's inhibitions of meeting their dietary intentions of consuming healthy foods (i.e., more fruit and vegetables and fewer high calorie foods and beverages), particularly when stressed (Bennett et al., 2013). Low mentally tough individuals do not possess as effective coping skills (Kaiselar et al., 2009), therefore alternative sources such as fatty textured food may be relied on to enhance mood and relieve stress (Gibson, 2006). It appears that increasing confidence in abilities to cope with stressors and overcome challenges could be an important consideration for enhancing students' dietary consumption.

Picky eating, which is characterised as rarely incorporating new foods, was most strongly related to the challenge component. A higher challenge component is related to perceiving an event as an opportunity to try new experiences, as opposed to a threat to avoid (Strycharczyk & Clough., 2015). In the current study, new experiences may include trying new foods and welcoming opportunities such as learning new recipes. Being more open to new experience can allow consumption of unfamiliar healthier foods (e.g., exotic fruit) as opposed to more familiar less healthy foods (e.g., convenience food; Mottus, McNeill, Jia & Deary, 2013). Therefore, enhancing the challenge component (see Crust & Clough, 2011 for potential methods) can broaden the range of food an individual consumes.

Some expected relationships (e.g. MT and emotional eating) were not evident, a potential explanation may be due to the reported *dark side* of MT as discussed in the previous chapter (Drawbacks of Mental Toughness section, p. 28). In line with the HBM mentally tough individuals may underestimate the severity of an unhealthy diet. This is similar to reports of mentally tough exercisers having lower injury severity perceptions and not taking health related advice to rest, which can potentially cause further injury (Crust, Swann, et al., 2014). In terms of the current sample, those with a high MT may benefit from raised awareness of the implications of healthy behaviours. Knowledge alone would appear not to aid behaviour changes (Lovell, Nash, Sharman & Lane, 2015), however, the interventions should focus on promoting and changing the individual's perceptions and priority of healthy behaviour as well as the threat of unhealthy behaviours.

Hypothesis Three: Mental Toughness and Psychological Wellbeing

The present study supported the third hypothesis that MT was significantly related to psychological wellbeing. All components of MT were significantly related

to all components of psychological wellbeing. This is congruent with more recent work which has reported MT to be significantly related to psychological wellness (Golby and Wood, 2016), and life satisfaction Gerber et al. (2013) amongst undergraduate university students.

Commitment was the strongest predictor of environmental mastery and a strong predictor of purpose in life. Environmental mastery reflects managing the multiple and complex demands of student life (Wynaden, Wichmann & Murray, 2013), which potentially promotes deep engagement and persistence. Similarly, leading a meaningful life and maintaining a sense of purpose and direction mirrors being deeply involved and committed to what one is doing (Kobasa, Maddi & Kahn, 1982). Thus, commitment appears important in relation to enhancing MT when considering students' psychological wellbeing.

Interpersonal confidence being the most significant predictor of autonomy is theoretically logical as autonomy refers to self-determination, independence and an ability to resist social pressures (Ryff & Keyes, 1995). Furthermore, interpersonal confidence is the most strongly related MT component with independence (Clough & Strycharczyk, 2014). This highlights enhancing students' interpersonal confidence can promote a sense of autonomy, which is a key outcome of higher education (Cottrell, 2013).

Unexpectedly, interpersonal confidence was not the strongest predictor of positive relations with others; potentially high interpersonal confidence may lead to over assertiveness. Instead the strongest predictor of positive relations with others was confidence in abilities. Confidence in abilities was also the strongest predictor of self-acceptance, which refers to holding positive evaluation of one self as well as past life. Confidence in abilities being associated with optimism and personal

perceptions of worthiness provides theoretical support for this relationship (Clough & Strycharczyk, 2012). Additionally, this relationship is in line with self-efficacy theory (Bandura, 1989), in particular past accomplishments which is the most consistent source of reported self-efficacy. Increasing confidence in abilities, for example may reflecting on previous achievements, may enable the students to develop positive relationships with others which may benefit provide benefits psychologically, and potentially to their career too.

Challenge was the strongest predictor of personal growth, and this relationship is potentially grounded in psychological theory (Kobasa et al., 1982). It reflects challenge seekers choice of approaching rather than avoiding difficult situations, and their liking of competition and problem solving (Clough & Strycharczyk et al., 2012), and ultimately achieving personal growth through learning by many varied experiences. Therefore, encouraging the students to view challenges associated with university as an opportunity for development may enhance one's personal growth component of psychological wellbeing.

Mental Toughness and All Health-Related Lifestyle Factors

High levels of MT are associated with effective time management, maintaining several commitments at once, working hard, having a sense of purpose, being less influenced by others, the perception of being in control, and self-selecting behaviours as opposed to 'drifting' through life (Clough & Strycharczyk, 2015). Furthermore, mentally tough individuals directly address problems (Nicholls et al., 2008) and effectively cope with stressors (Gerber et al., 2013), perceiving challenges as an opportunity rather than a threat (Clough & Strycharczyk, 2015). This may offer explanation as to why mentally tough individuals may maintain a healthier lifestyle during a critical life period, be able to effectively cope and adapt to the environment,

circumnavigate perceived barriers to exercise to ensure they remain physically active, remain in control of dietary consumption, and psychologically manage the associated challenges and stressors of higher education. In contrast, individuals with lower MT tend to adopt more avoidance coping strategies (Nicholls et al., 2011) and view obstacles as threats to be avoided and lack control over lifestyle choices, which may explain why these individuals are less able to display healthy lifestyle behaviours compared to the mentally tough individuals.

These theoretical relationships offer explanation as to why MT can contribute to university students leading a healthier lifestyle. It is apparent however, that other factors in addition to MT play a role in HRLF amongst university students. Nevertheless, targeting MT appears a promising way to contribute towards modification of HRLF amongst students. MT may appeal to populations who are normally hard to reach with preventative health interventions, due to MT appearing less academic than other health psychology concepts (Gerber et al., 2013).

Strengths, Limitations, and Future Directions

Strengths. A strength of the present study was the inclusion of participants from all three undergraduate years, from several institutions, and from a range of subjects. Furthermore, the multidimensional approach to measure MT allowed the role of individual components of MT to be identified, this may enable researchers to develop and test targeted interventions. Furthermore, the current study has taken a more positive perspective regarding mental health and has used a measure of psychological wellbeing rather than assuming that wellbeing simply reflects the absence of illness, as observed in numerous studies researching this area (e.g., Matthews et al., 2016).

Limitations. Limitations of the present study included low control over online data collection in terms of potential influences on the participants, which may have affected some responses (e.g. presence of others). There was potential of social desirability which is a problem with all questionnaires. The unreliable data collected by the IPAQ also posed a limitation, and thus was not included in the analysis. Participants appeared to provide unrealistic responses to how many hours a day they were physically active, for example seven hours a day were claimed to be spent during vigorous physical activity, which may potentially be due to participants not understanding the questions. However, the demographic question regarding physical activity participation was perceived to provide sufficient information, and was clearer for the participants to respond to. Additionally, only a small percentage of students contacted (around 10%) actually completed the questionnaire with the majority being female respondents, however of those who clicked on the link to view the participant information sheet there was a 53% completion rate. Furthermore, some students may not have held a goal or the desire to lead a healthy lifestyle, and instead focused on academic aspects of university life.

Future directions. To develop the understanding of this area future researchers should consider measuring actual behaviour recorded in real time (e.g. accelerometery to assess physical activity), as opposed to self-report measures requiring recall. Future research should consider longitudinal designs and experiments to examine behaviours in the long term. Finally, MT is defined as an individual's ability to achieve their goals irrespective of the prevailing circumstances (Strycharczyk & Clough, 2015). Potentially the primary goal of many students is to pass assessments and cope with the stressors relevant to their year of study, and lifestyle behaviours can become a secondary importance. Therefore, although the

current study has progressed the understanding of MT and highlighted the applicability of the concept extends beyond sport and into health-related lifestyle behaviours, future work could explore the role of MT amongst a population with a goal to lose weight.

Applied Recommendations

The MTQ48 could be used as a screening device to identify students at risk of adopting unhealthy lifestyle behaviours or decreased psychological health. Suitable interventions could be offered to these students prior to (i.e., whilst at college), and during, time at university. Interventions that target the most important aspects of MT in relation to lifestyle behaviour could be used to facilitate students towards adopting and maintaining a healthier lifestyle. Control is one of the least hereditable components of MT (Horsburgh et al., 2008) and emerged as an important MT component in relation to HRLF, which provides promising support for this being a suitable element of MT that can be targeted and modified amongst university students.

It may be suitable for the interventions to target perceptions, as the majority of barriers discussed in this chapter are controllable, solvable, and perceived, rather than actual barriers. Alternatively, similar approaches to those adopted in sport psychology that have shown performance benefits from training participants to perceive anxiety as more facilitative (Hanton & Jones, 1999), may be useful in lifestyle behaviours (e.g. learning to perceive exercise fatigue as indication of a beneficial workout, or challenges which inflict stress as an opportunity to develop and learn new skills).

In addition to modifying an individual's MT, institutions could adapt the environment to reduce perceived barriers. For example, promoting convenient times

and locations of low cost exercise sessions, or providing sessions that are lower intensity to allow beginners to adapt to the pain of exercise and refrain from viewing it as an unrewarding sensation. In relation to dietary behaviour, universities could reduce the amount of readily available calorie dense convenience food. This change could allow fresh and healthy food to become the social norm, thus meaning a lower reliance on individuals' levels of self-control to resist unhealthy food. Alternatively, institutions could offer services that develop confidence in abilities to cook a nutritional meal. Psychological wellbeing could be protected through sufficient readily available support for students, particularly during challenging times such as commencing university or sitting exams, as well as being taught effective coping mechanisms for stressful situations. As MT components such as interpersonal confidence is lower in those with a lower psychological wellbeing, the service would need to be easily accessible due to the unlikely nature of low MT individuals to independently seek help. Therefore, as well as providing interventions to target students' MT, higher education institutes can also modify the environment to assist those with a lower MT.

Conclusion

The first study in this thesis has addressed the first research objective, which has demonstrated the importance of MT in relation to HRLF in university students, and indicates MT does play a role in leading a healthy lifestyle. The current work has offered further evidence that individual differences are part of a complex range of factors that determine lifestyle choices. MT can influence physical activity levels, exercise barriers, dietary behaviours, and psychological wellbeing, and thus appears an important individual difference to target in relation to enhancing HRLF. Control and confidence are consistently reported as being important correlates of HRLF. This

is in line with previous research that highlighted the importance of these components within university samples in relation to academic achievement (Crust, Earle, et al., 2014).

Chapter Four – Study Two: Longitudinal Investigation of Mental Toughness and Weight Loss in Slimming Club Members

Introduction

Study One identified significant relationships between MT and lifestyle behaviours, specifically physical activity, eating identity, and psychological wellbeing in university students who responded to the questionnaire. MT accounted for a significant variance in modifiable HRLF. In order to progress this line of enquiry, a sample who hold a specific goal to lose weight as a result of changing HRLF could be explored. Students may have had limited focus on HRLF that can influence weight due to other priorities such as academic demands. As MT is related to achieving goals (Clough & Strycharczyk, 2015), a population who specifically wish to address HRLF in order to achieve a goal would be of interest. To follow this line of enquiry, a longitudinal study assessing MT and weight loss progress in individuals who wish to change their lifestyle behaviours for health benefits (e.g., weight loss) was conducted, which contributed to the call to identify potential predictors of weight loss and successful weight loss maintenance (Stubbs, Pallister, Whybrow, Avery & Lavin, 2011) - an important topic given the current health status of the population (e.g., over half the adult population being overweight or obese; PHE, 2016). This Study offered suggestions for future weight loss services and interventions. This study addressed the second research objective (i.e., longitudinally investigate MT and weight loss in slimming club members).

Significant relationships were reported between MT and physical activity, dietary consumption, and psychological wellbeing (Stamp, Crust & Swann, 2014a). The current study continued to assess MT in relation to eating identity, in addition to the primary aim of MT and weight loss. The questionnaires assessing physical activity levels, exercise barriers, and psychological wellbeing were disregarded. The decision was due to Slimming World (SW) being concerned there would be too

many questions for their members to respond to. Thus, the rationale for selecting the eating identity questionnaire was three-fold: (a) dietary consumption plays a greater role in weight loss than exercise (Franz et al., 2007); (b) SW conducted a similar questionnaire to psychological wellbeing, which assessed compassionateness, thus eating identity provided a novel finding to the company; and (c) the measure of physical activity in Chapter Three was not reliable. The role of physical activity is not ignored however, as participants in the present study were trying to lose weight following SW support on physical activity and dietary changes.

Trying to lose weight can be a psychological and emotional journey, and appears to be accompanied with success and failure (Rogerson et al., 2016), as well as challenges, uncertainty, and failed attempts (Stubbs & Lavin, 2013). Effective behavioural strategies can facilitate weight management (Rogerson et al., 2016). Several behaviours associated with weight loss success are characteristics of MT, as discussed below and displayed in Table 4.1.

Mental Toughness and Facilitators and Barriers of Weight Loss

The facilitators of losing weight (as discussed in Chapter Two; Barriers and Facilitators of Leading a Healthy Lifestyle and Losing Weight, p. 57) reflect skills of a mentally tough individual. For example, planning (Kaiselar et al., 2009), having clear goals and a sense of purpose (Crust, Swann, et al., 2014), and a higher punishment sensitivity (Hardy et al., 2013) which may deter the individual from unhealthy behaviours in an effort to avoid the punishment of weight gain. Skills such as goal setting (Crust & Azadi et al., 2010) and reflection (Crust & Clough, 2010) are associated with a higher MT, and have recently being reported amongst mentally tough exercisers to aid achieving their exercise goals (Crust, Swann, et al., 2014).

Table 4.1

Potential Links Between Factors That Influence Lifestyle Behaviours and Each Component of Mental Toughness

Factor which influences lifestyle behaviour	**Links to MT literature**	**MT Component**
Being a picky eater restricts the individual from consuming a varied and balanced diet (Mottus et al., 2013)	Openness to new experiences (e.g., new food) is significantly and positively related to MT, and challenge (i.e., being open to new experiences) held the strongest relationship (Horsburgh et al., 2009)	Challenge
Realistic goals can enhance weight management (McKee et al., 2013)	Mentally tough athletes are deeply involved and committed to what they do and may seek out alternative ways of enhancing their performance, for example goal setting which is most strongly related to commitment (Crust & Azadi, 2010)	Commitment
Family members could act as saboteurs, tempting the individual, irrelevant of knowing their weight loss challenges and goals (Rogerson et al., 2016)	Mentally tough footballers resist the temptation offered by others (e.g., attending parties) and remain focused on their training goals (Cook et al., 2014)	Control (life)
Emotional eating appears to drive overweight and obese individuals to overeat (Koenders & Strien, 2011)	Mentally tough individuals can keep their emotions and anxieties in check (Strycharczyk & Clough et al., 2015), and MT is significantly related to athletes employing emotional control as a performance strategy (Crust & Azadi, 2010)	Control (emotional)
Increase in exercise self-efficacy is associated with weight loss, thus it may be beneficial to enhance confidence in abilities to exercise (Byrne et al., 2012)	Self-efficacy is significantly related to MT (Clough et al., 2002)	Confidence (abilities)
Barriers to leading a healthy lifestyle such as ‘no one to help me’, ‘lack of information’, and ‘lack of help from health care professionals’ were reported (McGuire et al., 2014)	Interpersonal confidence is potentially associated with having the confidence to interact with others and ask questions when necessary (Crust, Earle. et al., 2014)	Confidence (Interpersonal)

Therefore, these mentally tough traits may facilitate an individual's adherence to a healthy lifestyle.

Characteristics associated with MT could be expected to help individuals overcome barriers to weight loss. For example, MT is associated with emotional control strategies (Crust and Azadi, 2010), coping with stressors (Nicholls et al., 2011), superior problem

solving skills, (e.g. active problem solving as opposed to problem avoidance or resignation), and more effective planning ability (Kaiselar et al., 2009). In addition, mentally tough individuals can resist the temptation of distractions, remain focused and in control of choices (Cook et al., 2014), bounce back after setbacks (Strycharczyk & Clough, 2015), and have the confidence to seek help when required (Crust, Swann, et al., 2014). High mentally tough Australian footballers reported significantly greater intrinsic motivation than moderately mentally tough footballers (Gucciardi et al., 2009), similarly mentally tough exercisers are independent (Crust et al., 2014), thus mentally tough individuals have a lower reliance on unstable external motivation and positive reinforcement from others.

Weight loss is a challenging journey that can be accompanied with uncertainty and failed attempts (Stubbs & Lavin, 2013). Previous failed attempts at weight loss may hinder subsequent weight loss efforts, as according to Bandura's (1989) self-efficacy theory previous accomplishments influence an individual's belief in their ability - numerous failed attempts of weight loss may decrease weight loss self-efficacy. Previous failed attempts to lose weight may be less problematic for less mentally tough individuals, as they have a greater ability to forget irrelevant information (Dewhurst, Anderson, Cotter, Crust & Clough, 2012). Levy et al. (2006) found lower mentally tough individuals can dwell on negatives, such as pain during

sports rehabilitation. Together, these two findings demonstrate those with a lower MT may place greater emphasis on the negative effects of adopting healthier lifestyle behaviours (e.g., unpleasantness of exercise), as well as been influenced by previous attempts. Furthermore, as adversity can impair weight loss maintenance (Burnette & Finkel, 2012), mentally tough individuals' ability to cope with adversity and rebound from setbacks (Bull et al., 2005) would be expected to be a benefit.

Numerous studies, like Study One, offer a cross sectional approach to exploring psychological correlates of healthy behaviours (e.g., Gerber et al., 2012; Stamp, Crust, Swann, Perry, Clough & Marchant, 2015). In order to investigate the outcome of modifying HRLF a follow up phase is required to assess change. This can explore whether healthier behaviours were adopted and weight loss was achieved and maintained; maintenance is an important consideration in light of the high rates of attrition associated with lifestyle interventions, which has been reported to reach 77% (Inelman et al., 2005). To get a clear perspective of how psychological constructs can influence lifestyle behaviour adoption *and* maintenance, and ultimately weight loss achievement, a longitudinal study can track the outcome of weight change in relation to the individual difference MT. This would be in line with previous research that has explored performance outcomes in relation to MT (e.g., outcome of attending university was progressing to proceeding year; Crust, Earle, et al., 2014), as opposed to the individual's behaviour to achieve the outcome (e.g., hours studying). Adopting this approach within the current thesis can allow MT and weight change to be explored, and enable MT to be monitored over a period of time. Members of a slimming club, such as Weight Watchers or SW, would be a suitable sample as all individuals join holding the goal to lose weight.

Research Aims

The aim of this longitudinal study was to explore MT and lifestyle behaviours in individuals who are members of a slimming club and wish to lose weight. This study will contribute to addressing research objective two (i.e., longitudinally investigate MT, and health related lifestyle behaviours and weight loss). The present study had three hypotheses:

1. MT is significantly and positively associated with weight loss in slimming club members
2. MT is significantly and positively associated with attendance to SW sessions in slimming club members
3. MT is significantly and positively associated with healthier eating characteristics in slimming members

Method

Participants

Participants were members of the slimming club SW. The study began with 1493 participants, including 75 males and 1418 females living in the UK or Republic of Ireland. Following data collection, of those who attended the service and met the inclusion criteria (Figure 4.1) 132 participants remained (5 males, 127 females) with an average age of 48.14 ± 11.85 years. All participants joined SW in January 2014, the sample had an average weight of 98.55kg. The low proportion of male participants reflects previous SW study samples that have investigated weight loss (Stubbs et al., 2012).

Research Design

A longitudinal study was conducted which allowed change to be assessed (i.e., weight change) over a period of time (Howitt & Cramer, 2005) to investigate the effect of the independent variable (MT) on the dependent variables (weight change, eating identity, and attendance). The prospective data collection involved in this design meant that memory recall was not relied upon (Jupp, 2006). The study started in January 2014 and lasted six months, weight was collected weekly and online questionnaires were administrated at baseline, one-month, three-months, and six-months.

Slimming world. SW has been established for over four decades, it is a nationwide slimming club which holds over 13, 000 group meetings each week across the UK and Ireland (Slimming World, 2016). All members share the same goal of reaching a set personal target weight, and once achieved the aim is to maintain their weight. The network consists of 800,000 members and over 4,000 trained SW consultants (Slimming World, 2016). The multidimensional service addresses behaviour change of physical activity and diet; SW provides dietary plans based on energy density and satiety (absence of hunger) and physical activity guidance. The service uses evidence-based strategies and actions consisting of self- regulation (e.g., recording body weight, food intake, and activity), motivational components for behaviour change (e.g., enhancing self-efficacy for healthy behaviours), and emotional regulation (share experiences and receive peer support in a non-judgemental environment; Stubbs, Morris, Pallister, Horgan & Lavin, 2015).

The Slimming World Service

All participants in the study attended their first SW session. During the first session, a personal target weight was set and weight was monitored each week the participant

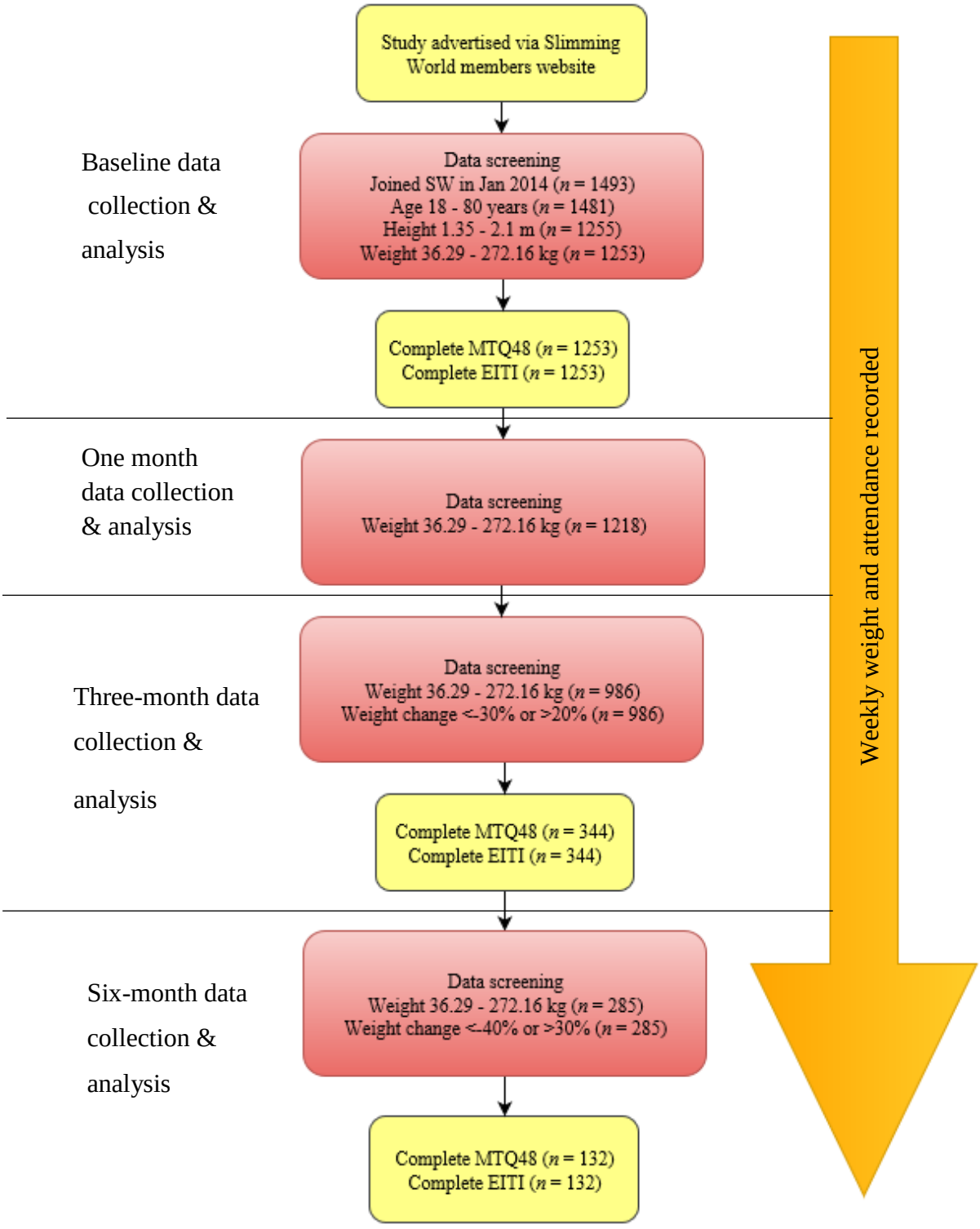

Figure 4.1. The Protocol Followed in Study Two

Note. Yellow (light shaded) boxes display procedures and data collected. Red (dark shaded) boxes display the standardised SW inclusion criteria. *n* = the number of participants remaining at each stage

attended. SW provided members with a log book to record their daily food intake, activities, and emotions. Although participants received this resource, it was not compulsory to complete it. Progress was rewarded and positively reinforced through the use of stickers and certificates for each half stone (3.18kg)[3] and whole stone (6.35kg) of weight lost, these achievements could be kept in the log book. Once the weight loss goal was achieved, while ever the member was within 3 lbs (1.36kg) above or below their target weight, their membership was free. Following the first session participants' attendance varied over the course of the study, and despite each weekly session following the same structure, sessions across the country did have variances. Along with the variance in sessions, the amount the individual engaged with the service was also dependent on the member and their starting weight loss.

Sessions begin with a weigh-in followed by image therapy which enabled members to share ideas, experiences, and offer support. The leaders talked to each member individually in front of the group, and if someone gained weight ideas regarding what they could do differently were explored, whereas if someone has lost weight this was celebrated. Members could receive support and advice from peers and the leaders for challenges they had encountered or were expecting to encounter. This can help the individual solve problems or learn to deal with certain situations. The session finished with the title 'Slimmer of the Week' being awarded to the person who had lost the most weight, again this was positively rewarded by receiving a certificate, stickers, and some healthy food. In addition to weekly weigh-ins, members could receive support between meetings from their leader or peers

[3] Values used in SW terms are imperial units (i.e., stone and pounds, feet and inches), conversion to metric unit (i.e., kilograms, meters and centimetres) are in brackets to maintain consistency with the data reported in this thesis

through a closed SW online group forum and social media. For those who could not attend weekly sessions, or did not wish to, an online support network was available.

Procedure

The lead researcher was introduced to SW by a colleague in the department at the University of Lincoln, along with their two PhD supervisors, during a meeting with two members of staff from the SW head office. The proposal of the work was discussed and confirmed via e-mail. Ethical approval was sought from the relevant local ethics committee at a UK university, and the study was also approved by SW. It was agreed that the lead researcher would not have access to participant information that could reveal the participants' identity (e.g., name address), and that a member of the data analysis team at SW would download and anonymise the data before transferring it to the researcher. All data was stored on a password protected computer to reduce the likelihood of data leakage. The study was advertised on the member's exclusive SW webpage in January 2014 (Appendix H). The advert contained information about the study and a link for potential participants to follow. The information was intentionally vague to avoid influencing participants, for example the terms self-perceptions was used as opposed to MT. After reading information about the study, willing members provided informed consent and continued to the questionnaires. Participants understood their data would be treated confidentially and anonymously by the researcher and that they had a right to withdraw at any time by not responding to any future e-mails or questionnaires. The participant provided their unique SW membership number which enabled questionnaire data to be matched to background information (e.g., age, gender, weight, attendance). Furthermore, this enabled a check that all participants did join in January 2014.

The baseline questionnaires consisted of the MTQ48 and the EITI which were explained in the previous chapter. The MTQ48 and EITI were redistributed to participants at three and six months. Weekly weight and attendance was also recorded. An overview of the procedures, along with the inclusion criteria provided by SW, are displayed in Figure 4.1. The inclusion criteria set parameters for height, weight, and percentage weight change, to ensure that the data was realistic in terms of how much weight is achievable for an individual to lose in a given time frame. Furthermore, additional inclusion criteria for the purpose of this study were added (e.g., completion of questionnaires). Following data collection, a statistician based at SW downloaded all the data and matched the participant's questionnaire responses with their personal data; personal information such as name or contact details were removed at this stage. The anonymised data were then transferred to the researcher of the current study. Following the three-month data collection point data were transferred via e-mail. At the six-month data collection point the lead researcher visited the SW head office to retrieve the data and discuss the next steps of the research, which formed subsequent studies in this thesis (i.e., Study Four). A debrief was also provided thanking the participants for their time, explaining the nature of the experiment, and contact details of the lead researcher should any questions arise.

Data Analysis

Data analysis was conducted in SPSS version 22. Data were initially screened for outliers and missing variables using the ± 2.5 median absolute deviation about the median (Leys et al., 2013). This is more effective than using the typical ± 3 standard deviation method, as it does not use outliers to calculate the deviation. Kurtosis and skewness were measured to test normality of the data, which is important for the statistical assumptions of tests such as hierarchical multiple linear

regression. Mean and standard deviation of variables were calculated before proceeding with statistical data analysis. Cronbach alpha scores were calculated to assess the internal consistency of the validated questionnaires.

Sten scores were calculated to compare the average MT of the current sample to the general population (Clough & Strycharczyk, 2012). At each data collection, the data were screened using SW standardized inclusion parameters as demonstrated in Figure 4.1. Anything outside of the parameters was deemed as either an unhealthy weight change or incorrectly input data and was excluded.

There were some missing cases for the variable weight. Previous research has used the last observation carried forward method to fill in missing data points (e.g., Stubbs, Pallister, Whybrow, Avery & Lavin, 2011), which involves the last recorded weight for a participant being carried forward as their end weight. Although such methods can retain a high number of participants, as those who have not recorded a final weight are still included in the analysis, it can also cause bias in the results (Saha & Jones, 2009) as it is unknown if individuals have gained weight or lost more weight since their last observation. Therefore, the current study used linear interpolation to fill in missing data cases for weight. Data was linearly interpolated up to a two-week gap for the four-week data collection point, and up to a four-week gap for the, 12, and 24-week data collection points. As the current study is using time series data, interpolation is also more appropriate than using a group average approach. Any weight that was missing following interpolation resulted in the participant being removed.

Pearson correlations were conducted to identify the relationship between MT and eating identity, weight change, and attendance. To control for demographic effects, hierarchical multiple linear regression (enter method) examined the

predictive capacity of MT in relation to eating identity. Each eating identity was separately inserted as a dependent variable in separate analyses. At step one, gender and age were entered. Each MT component was entered at step two. Hierarchical regression is the most suitable method when controlling for other factors (i.e., gender and age; Field, 2009), as well as when the predictor variables entered are correlated with each other (Pedhazur, 1997 cited in Lewis, 2007). The data met the assumptions of hierarchical linear regression (i.e., data were normally distributed, was on an interval scale, and did not display multicollinearity; Field, 2009). One-way within-subjects analysis of variance with LSD post hoc was conducted to identify if there were any significant changes in MT components or eating identities between the baseline, three months, and six months, data collection points.

Results

Testing for Normality, Outliers, and Internal Consistency

Tests of univariate normality found all data were within standard limits of kurtosis and skewness (< ± 2). Values classed as an outlier (1.2% of all cases) were deleted (Leys et al., 2013). Descriptive statistics are displayed in Table 4.2. MT subscales had good internal consistency (α = .82 - 96) except for emotional control (α = .52). Interim correlation matrix was examined to identify troublesome items in the emotional control subscale, negative correlations were identified between items 26 and 34 which is in line with previous research (Perry et al., 2013), resulting in the removal of these items. The five remaining items for this subscale had a Cronbach alpha of .64 and were used as a measure of emotional control in all proceeding analyses. All eating identity scores displayed good internal consistencies with the exception of meat eating identity (α = .58), following examination of the interim

correlation matrix item nine was identified as problematic and once removed a good reliability score was reported (α = .75), which reflects the findings of Bake et al. (2013).

Descriptive Statistics

Table 4.2

Descriptive Statistics, Internal Consistency Coefficients of Measured Variables, and the ANOVA's to Compare the Measured Variables in the Study Completers

	Cronbach alpha	Baseline		One month		Three months		Six months	
		M	SD	*M*	SD	*M*	SD	*M*	SD
Overall MT	.96	2.98†	.43	-	-	3.42*	.44	3.37*	.44
Chl	.82	3.51†	.49	-	-	3.63*	.43	3.66*	.48
Com	.88	3.50†	.53	-	-	3.65*	.45	3.64*	.52
Emo	.64	2.84†	.63	-	-	3.02*	.56	3.03*	.60
Lif	.83	3.33†	.61	-	-	3.48*	.56	3.54*	.58
Abl	.87	3.05†	.67	-	-	3.16*	.65	3.26*†	.67
Int	.86	2.79†	.65	-	-	3.43*	.70	3.49*†	.71
Healthy	.88	3.74	.61	-	-	4.19*	.62	4.18*†	.67
Emotional	.78	3.95	.93	-	-	3.60*	.98	3.53*†	1.00
Meat	.75	3.59	.85	-	-	3.56	.83	3.51*	.83
Picky	.79	1.88	.74	-	-	1.78*	.78	1.86*†	.80
Weight (kg)	-	98.55	19.46	94.04*	18.46	89.19*	18.00	83.74*	16.60
BMI (kg/m^2)	-	35.82	6.53	34.19*	6.26	32.44	6.14	29.70	5.51
WC (%)	-	-	-	-4.53	1.41	-9.49	2.80	-14.23	4.94
Attendance (%)	-	-	-	99.09	4.18	97.09	4.80	93.76	6.18

Note. Chl = challenge, Com = commitment, Emo = emotional control, Lif = Life control, Abl = confidence in abilities, Int = interpersonal confidence, Healthy = healthy eating identity, Emotional = emotional eating identity, Meat = meat eating identity, Picky = picky eating identity, WC = weight change, Att = attendance. * Statistically significant at $p < 0.01$ from baseline value. † Statistically significant at $p < 0.01$ from three months

Average MT of the sample (n = 132) was 2.98 ± .43. The sten score of the current sample was significantly lower (M *sten* = 4.73; p <0.01) than the average MT of the general population. The initial MT scores of the completers (M = 2.98 ± .43) and non-completers (M = 2.98 ± .46; $p > 0.05$) were not significantly different.

Completers started with an average weight of 98.55kg (19.46), losing a significant amount of weight (-14.81 kg; $p < 0.01$) throughout the six months. On average, completers attended 93.76% of the sessions over the six months. From the initial 1493 participants who signed up, 132 (10%) completed all questionnaires, and had a weight recorded for at least the time points that were analysed (baseline, one month, three months, and six months).

Bivariate Correlations

Table 4. 3

Bivariate Correlations between Mental Toughness and Eating Identity, Weight Change, and Attendance to Sessions

	Overall MT	Chl	Com	Emo	Lif	Abl	Int
WC 1 month	-.09	-.15	-.17	-.04	-.02	.03	-.13
WC_3 month	-.14	-.23**	-.23**	-.05	-.09	-.05	-.11
WC_6 month	-.15	-.20*	-.24**	-.07	-.11	-.02	-.15
Att. 1 month	.12	.03	.06	.06	.05	.09	.15
Att.3 month	-.03	-.09	-.03	.05	-.12	.03	-.01
Att. 6 month	.03	.02	.11	.03	-.04	.06	.03
Healthy	.11	.25**	.16	.03	.08	.04	.01
Emotional	-.30**	-.32**	-.25**	-.19*	-.29**	-.32**	-.13
Meat	-.01	-.07	.04	-.71	-.04	-.06	-.13
Picky	-.26**	-.35**	-.23**	-.24**	-.24**	-.17	-.22*

Note. Chl = challenge, Com = commitment, Emo = emotional control, Life = life control, Abl = confidence in abilities, Int = interpersonal confidence, WC = weight change, Att = attendance, Healthy = healthy eating identity, Emotional = emotional eating identity, Meat = meat eating identity, Picky = picky eating identity. * Statistically significant at $p < 0.05$. **Statistically significant at $p < 0.01$. *** Statistically significant at $p < 0.001$.

Pearson bivariate correlations are displayed in Table 4.3. Overall MT was not significantly related to weight change or attendance. This was also the case for all subcomponents with the exception of challenge and commitment, which displayed a negative weak relationship with weight change at three months and six months. Baseline MT was significantly related to baseline eating identity; the strongest relationships were between picky eating and challenge (r = -.35, p < 0.01), emotional eating and overall MT (r = -.30, p < 0.01), and emotional eating and confidence in abilities (r = -.32, p < 0.01), which all displayed a negative relationship.

Hierarchical Multiple Linear Regression

Hierarchical multiple linear regressions were conducted to explore the amount of variance MT accounted for in each eating identity (Table 4.4). Consistent with findings of previous work (O'Brien, 2007) there was no multicollinearity evident in the data as all the predictor variables had a Variance Inflation Factor (VIF) of less than 5 (1.66 – 3.75), and the collinearity statistics exceeded .10 (.27 -.60; Myres, 1990). Picky eating was negatively predicted by challenge (β = -.31, p < .01). Although accounting for 13% of the variance in emotional eating, none of the MT subscales were significant predictors of emotional eating.

Table 4.4

Hierarchical Multiple Linear Regression Analyses for Eating Identity with Mental Toughness

Variable	Step 1 Age, gender	Step 2 Sig. related MT variables
Healthy	Adj R^2 = .03, *F* (2, 111) = 1.85 Gen β = -.16, Age β = .08	ΔR^2 = .07, *F* (8, 105) = 1.55 Chl β = .24, Com β = .13, Emo β = -.12, Life β = -.04, Abl β = .01, Int β = -.13
Emotional	Adj R^2 = .03, *F* (2, 126) = 2.15 Gen β = .01, Age β = -.18	ΔR^2 = .13**, *F* (8, 120) = 2.90** Chl β = -.21, Com β = -.01, Emo β = .07, Life β = -.03, Abl β = -.26, Int β = .06
Meat	Adj R^2 = .12, *F* (2, 117) = 8.06** Gen β = -.14, Age β = -.36**	ΔR^2 = .04, *F* (8, 111) = 2.58 Chl β = -.07, Com β = .12, Emo β = -.10, Life β = -.11, Abl β = .03, Int β = .15
Picky	Adj R^2 = .02, *F* (2, 123) = 1.51 Gen β = .12, Age β = .11	ΔR^2 = .16**, *F* (8, 117) = 3.21** Chl β = -.31**, Com β = .07, Emo β = -.18, Life β = -.09, Abl β = .19, Int β = -.18

Note. Gen = gender, Chl = challenge, Com = commitment, Emo = emotional control, Lif = Life control, Abl = confidence in abilities, Int = interpersonal confidence. * Statistically significant at $p < 0.05$. **Statistically significant at $p < 0.01$. *** Statistically significant at $p < 0.001$.

Discussion

The aim of this study was to investigate MT and outcome behaviours in SW members (i.e., weight loss, attendance) and eating identity. Several interesting findings were reported, however not all findings were as predicted. For example, the hypothesis that MT would be positively related to weight loss was not supported. Some findings were as expected, for example the significant increase in healthy eating identity. Unexpectedly, overall MT did not display a significant relationship

with weight change throughout the study, and there was a weak relationship for two of the subcomponents (challenge and commitment) at three and six-month weight change.

Hypothesis One: Mental Toughness and Weight Loss

Over the six-month study, SW members lost a significant amount of weight. In relation to hypothesis one, MT components were not significantly related to weight loss progress. Challenge and commitment became weakly and significantly related to weight change at three and six-months. The extremely weak relationship infers if MT is playing a role in weight loss it is very small. MT and weight loss being predominantly non-significantly related may be attributed to the robust support programme offered by SW, which may have resulted in a ceiling effect. The service provided by SW may have supported and facilitated the members with a lower MT to utilise skills that a mentally tough person would naturally use. For example, when joining SW, a personal weight loss goal is set and monitored at weekly sessions, and goal setting and monitoring are amongst the characteristics that are associated with MT (Crust & Clough, 2011). Thus, the support offered by the SW service may mask the inferior coping and personal skills associated with low MT (Gucciardi et al., 2008), which may limit the difference observed in the data between high and low mentally tough individuals.

On average, members of SW reported significantly lower mental toughness compared to the general population, however there was a range of MT levels included (range = 1.83 - 4.09, out of a possible score of 1-5). Trying to lose weight is often accompanied with failure and uncertainty (Stubbs & Lavin, 2013). Potentially, those who have previously tried and failed to lose weight are more likely to have a lower MT due to decreased self-efficacy through previous failure

(Bandura, 1989). Furthermore, low mentally tough individuals who have failed to lose weight may lack cognitive inhibitions to forget irrelevant information of their previous failure (Dewhurst et al., 2012). However, it may not be an inability to forget the irrelevant information; it may be due to low MT being related to the low levels of the conscientiousness trait, which is associated with motivation and effort (Delany, Goldman, King & Nelson-Gray, 2015). Similarly, Gucciardi et al. (2016) reported MT to be associated with behavioural perseverance. When failure is experienced the higher mentally tough individuals may be more motivated and determined, whereas lower mentally tough individuals are more likely to resign (Kaiselar et al., 2009). Therefore, those with a lower MT may rely on the support provided by SW. It appears low MT is a common characteristic of SW members.

MT significantly increased over the six-months, raising the average MT closer to the mean of the general population. This is a valuable finding within the MT literature as methods of enhancing MT are often sought (Clough et al., 2002). The process of goal attainment (e.g., weight loss) can enhance self-efficacy (Bandura, 1989), which is associated with increased MT (Clough et al., 2002). Furthermore, vicarious experiences can also enhance self-efficacy (Bandura, 1989), for example seeing others within the club succeeding may encourage individuals to develop the confidence that they can achieve their goals too. Therefore, MT development may have been facilitated by other SW members.

On the other hand, it may be the robust support and tools provided by SW which enhanced MT. The SW service appeared to teach the behaviours of mentally tough individuals, for example problem focused coping (Kaiselar et al., 2009). Enhanced problem solving ability is related to greater weight loss amongst obese

females (Murawski et al., 2009). Furthermore, the process of adhering to something with support (i.e. from peers or partners) may have allowed MT to develop through reflection and achievement, which are characteristics associated with MT (Crust & Clough, 2011). By following SW standards of how the support classes should be delivered, the SW leader may promote MT development through the environment at their slimming class. A task-involving climate (e.g., rewards for effort and improvement in weight loss), as well as an autonomous environment (e.g., setting own weight loss goal, as opposed to being told a target weight), can enhance MT (e.g., Mahoney, Ntoumanis, et al., 2014; Nicholls et al., 2016). It is not possible to determine how much of an effect the SW service has on individuals' MT, as despite all participants being SW members the SW service cannot be classed as an intervention; the service was not consistent across all participants, with varied attendance and delivery styles across the country. The high attendance rates however, imply a good level of engagement amongst participants.

Hypothesis Two: Mental Toughness and Attendance

The current study did not support hypothesis two, MT was not significantly related to attendance at SW. Effective SW support may have managed the attrition associated with lower MT in other domains such as sport rehabilitation (i.e. Levy et al., 2006), which offers an explanation for the lack of a significant relationship between MT and attendance. Different parts of the service may have fostered member's adherence. For example, high mentally tough individuals may have strong commitment to a task and attend to avoid the punishment of missing sessions. This suggestion is in line with Hardy et al. (2013) who identified MT was associated with punishment sensitivity. The lower mentally tough individuals may be more motivated to attend the SW classes due to external motivation that can satisfy their

higher reward sensitivity (Hardy et al., 2013), such as positive reinforcement and achieving stickers and certificates for their achievements. Alternatively, a lower attendance may not always indicate a lack of success as people may have reached their target weight, found a new service to attend, or be completing a large part of the weight loss independently once the knowledge has been gained from SW. Therefore, qualitatively exploring why participants have left the service would be beneficial.

Hypothesis Three: Mental Toughness and Eating Identity

Support was provided for hypothesis three that MT would be significantly associated with healthier eating characteristics of members at a slimming club. MT displayed significant negative correlations with emotional and picky eating identity, and there was a significant positive correlation between healthy eating identity and challenge. These relationships appear logical. Healthy and picky eating identity were most strongly related to challenge, which appears to be an important component of MT in the current study. Challenge was also the strongest predictor of picky eating identity. Being more open to new experiences as opposed to viewing them as threatening is related to the challenge component (Strycharczyk & Clough, 2015), and such attitudes have been reported in relation to eating a more varied diet as well as being a healthier eater (Mottus et al., 2013). The relationship between MT and eating identity in this study appear stronger than those reported amongst undergraduate students (Stamp, Crust & Swann, 2014b). Potentially this may be attributable to those at the slimming club being more aware of their dietary habits, unlike the undergraduate students who may pay more attention to other life goals. Furthermore, this offers support for targeting the challenge subcomponent to enhance healthy eating.

The significant increase in healthy eating identity and decrease in emotional eating identity may be due to increased MT. MT displayed a significant correlation with these eating identities and may allow the individual to take control of their dietary choices and cope effectively with challenges, which may reduce their levels of stress. A higher MT may assist one to view the behaviour change as an opportunity to enhance health related lifestyle knowledge and adhere to dietary regimes. Alternatively, it may be the skills which were taught at SW that enhanced the understanding of healthy foods, that enhanced the healthiness of dietary consumption.

Strengths, Limitations, and Future Directions

Strengths. One strength of the current study was weight being collected within a SW session, which eliminates the possibility of underreporting weights that are associated with self-report data (Gorber et al., 2007) due to factors such as social desirability. Furthermore, the large network of SW clubs throughout the UK and Ireland provided a large sample size. In addition, the data were collected over a six-month period as opposed to being cross-sectional. Using liner interpolation to fill in missing data points can reduce bias associated with other methods to deal with missing cases (Saha & Jones, 2009), such as the last observation carried forward method (e.g., Stubbs et al., 2011).

Limitations. One limitation of this study was the lack of ability to track participant's weight if they did not attend the sessions. Potentially these individuals may have left due to a lack of commitment to losing weight, or alternatively due to achieving goals, or no longer requiring the support of the service. As there was not a significant difference in baseline MT between completers and non-completers of the

survey, it demonstrates the sample was not biased towards certain MT levels. A further limitation of the current study is the female heavy sample and results should be applied to males with caution; however, low male participation rates is frequently the case with SW samples (Stubbs et al., 2012) and gender was not found to be a significant predictor. A final limitation was that the target weight was not recorded. Take for example, a high mentally tough person who needed to lose 2% of their body weight to achieve their target weight, and a low mentally tough person who had a target weight that required 10% of their body weight to be lost. The low mentally tough individual may not meet their target and achieve a 5% weight loss, however they appear more successful than the high mentally tough individual who met their 2% target weight loss.

Future directions. Further research could record the target weight the individual wishes to achieve as a success criteria, as opposed to basing success on percentage of weight lost. Additionally, future work could explore the relationships between MT and weight loss progress in non-slimming club members who wish to lose weight. This would create a comparator group of a different population and enable further exploration of the MT in weight loss. The comparator group would also allow the investigation into whether the SW services created a ceiling effect and masked the effect of MT on weight loss progress.

Applied Recommendations

The current study displays that challenge is an important subcomponent of MT, and held the strongest relationship with healthy and picky eating identity. Therefore, the findings of this study may enhance the SW service by ensuring there is a focus on either increasing the challenge subcomponent, or altering the environment. The challenge subcomponent can be increased through increasing

familiarity of change (Clough & Crust, 2011), such as introducing new foods to try at weekly meetings. Furthermore, SW can focus on changing the individual's perceptions of weight loss from a threating and difficult challenge, to an achievable and beneficial process (e.g., making the process appear simple and achievable). Alternatively, SW could ensure greater emphasis is placed on achievement by identifying ways to circumnavigate problems, or promote the process of behaviour change as an opportunity to learn new skills (e.g., new sports, cooking), as opposed to a threat that the individual cannot achieve (e.g., it takes a lot of time took cook healthy food).

Conclusion

The current study addressed the second research objective in this thesis. MT did not appear to play a significant role in weight change, with the exception of commitment and challenge which displayed a weak significant relationship at three and six-months. This suggest that MT may have a different effect on one achieving success within the HRLF domain compared to areas such as sport and education. This unexpected finding may have been due to the support provided by SW which limited the relationships and created a ceiling effect, this may have compensated for those with a lower MT. Therefore, further work is required to identify whether the absence of the slimming world service results in alternative findings. Eating identities were found to be healthier following six months of SW attendance. Therefore, the current research can enhance the services SW offer by screening to identify those at risk of displaying less healthy eating behaviours, or identifying relevant components of MT the service can target.

Chapter Five: Study Three – Longitudinal Investigation of Mental Toughness and Weight Loss in Non-Slimming Club Members

Introduction

Study Two explored the relationship between MT and weight loss progress in new members of a slimming club – SW. It was suggested that the SW service created a ceiling effect, limiting the differences in weight loss displayed between high and low MT individuals. To follow this line of enquiry, work investigating a comparable sample (i.e. non-slimming club members who wish to lose weight) would allow the effect of MT on weight loss progress to be further explored, as well as investigate whether a ceiling effect did limit the results in Study Two. Therefore, this study aimed to investigate MT and weight loss achievement in non-slimming club members who held the goal of losing weight. Additionally, a by-product of the current study also explored whether the SW service in Study Two effectively managed those with a lower MT.

In Study Two the SW service potentially masked the effect of MT due to the support provided and skills taught. For example, skills such as goal setting that aid weight loss (McKee et al., 2013) and are associated with MT (Crust & Clough, 2011) were also promoted through the SW service (Slimming World, 2016). Furthermore, McGuire et al. (2014) reported detrimental effects on weight loss when positive reinforcement was removed, meaning the ongoing reinforcement received from leaders and peers (e.g., stickers, certificates, verbal encouragement) in SW may have provided motivation for those with lower MT, whereas the high mentally tough individuals may have had less reliance on such support due to their greater intrinsic motivation (Gucciardi et al., 2009). Therefore, the low MT individuals may have received support from SW, which enabled an increased weight loss success compared to losing weight independently. This study sought to address this issue, as

well as investigate the third objective in this thesis (i.e., investigate MT and weight loss by making lifestyle modifications).

Research Aims

The aim of the current study was to explore MT and weight loss in non-slimming club members who wished to lose weight. This was explored following a similar protocol to Study Two. The present study will contribute to addressing research objective three (i.e., investigate MT, and health related lifestyle behaviours and weight loss). This third study had two hypotheses:

1) MT will be significantly and positively related to weight loss progress in non-slimming club members.
2) Individuals with a greater MT will report significantly healthier eating identities.

Method

Research Design

A longitudinal study was conducted, which allows change to be assessed (i.e., weight change) over a period of time (Howitt & Cramer, 2005) to investigate the effect of the independent variable (MT) on the dependent variables (weight change, and eating identity). The prospective data collection involved in this design meant that memory recall was not relied upon (Jupp, 2006). The study started in January 2015 and lasted six months, with weight data collection at baseline, one-month, three-months, and six-months. The questionnaires were completed at baseline, three-months, and six-months.

Participants

The study began with 133 participants, which reduced to 78 (20 males and 58 females) following the inclusion criteria (see Figure 5.1). The remaining 78 participants were 35.53 ± 13.98 years old. Most participants were in full time employment (71.8%), few were part time (5.1%) or unemployed (1.3%), 16.7% were students, and the remaining 5.1% did not fit any of these categories (e.g., they were retired). The majority of participants were from the UK, however other ethnicities were included such as people from France, Australia, and New Zealand. All participants joined the study due to having the desire to lose weight, as requested in the participant information. All participants were aiming to lose weight by modifying dietary behaviours, physical activity levels, or both simultaneously.

Procedure

Ethical approval from the university ethics committee was granted for this study. The main considerations were confidentiality and the leakage of the participants' data; thus, all data was stored on a password protected computer. The minimum amount of personal data was collected for the purpose of this study (e.g., e-mail address to contact the participant for each data collection point). Following approval from a local ethics committee the study was advertised on social media (e.g., Twitter; Appendix I) to the public, as well as being sent to other academics who agreed to share the study with students and staff in their department. The advertisement was sent out in January 2015, a common time for people to try to lose weight due to New Year resolutions, which also matched the same time of year as the commencement of Study Two. The advertisement asked if people were wanting to lose weight and contained a link for potential participants to follow. After reading information about the study, willing members provided informed consent and

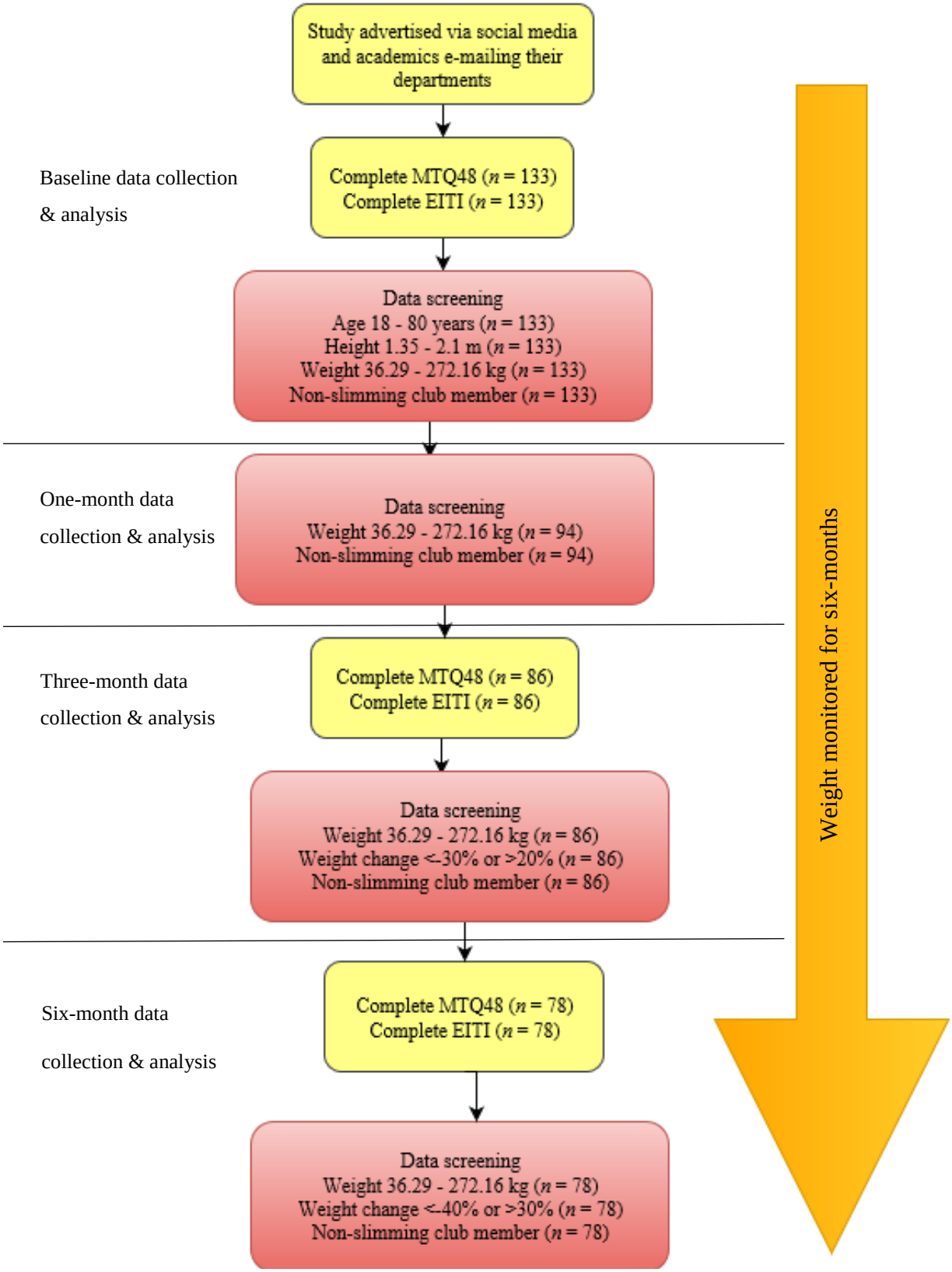

Figure 5.1. The Protocol Followed in Study Two

Note. Protocol followed. Yellow (light shaded) boxes display procedures and data collected. Red (dark shaded) boxes display the inclusion criteria. *n* = the number of people remaining at each stage

continued to the questionnaires. The questionnaires consisted of the MTQ48 and EITI as explained in Study One, and was distributed via Qualtrics: an online secure survey distributor which complies with industry standards (Qualtrics, 2013). Following data collection, responses were downloaded by the researcher and a debrief was sent to all participants. The debrief outlined the nature of the experiment, thanked the participants for their time, and provided contact details for the lead researcher for the participants to ask any questions. The MTQ48 and EITI were distributed to participants at baseline, three-months and six-months, and a target weight was recorded to address one of the limitations in Study Two. An overview of the procedures, along with the inclusion criteria at each stage, are displayed in Figure 5.1. Inclusion criteria are displayed in the red boxes in Figure 5.1 and were predominantly the same as those in Study 2 (weight, height, weight change, age, completion of questionnaires), an additional inclusion criteria of not being not being a member of a slimming club was incorporated. Participants did not attend an organised slimming club at the time of starting the study, which was checked at each data collection point, any participants who had joined a slimming club were excluded from the study. The initial weight of the group was 75.16 ±16.14 kg.

Data Analysis

Data analysis were conducted in SPSS version 22. Data was initially screened for outliers and missing variables using the ± 2.5 median absolute deviation about the median (Leys et al., 2013). This is more effective than using the typical ± 3 standard deviation method, as it does not use outliers to calculate the deviation. Values classed as an outlier were deleted (Leys et al., 2013). Kurtosis and skewness were measured to test normality of the data, which is important for the statistical assumptions of tests such as hierarchical multiple linear regression. Sten scores were calculated to compare the average MT of the current sample to the general population (Strycharczyk & Clough, 2015). For consistency,

the inclusion parameters provided by SW were implemented at each stage of data collection, with a further inclusion criteria check (not being a member of a slimming club), as demonstrated in Figure 5.1. Cronbach alpha scores were calculated to assess the internal consistency of the validated questionnaires.

Pearson bivariate correlations were conducted to identify the relationship between MT, and eating identity and weight change. To control for demographic effects, hierarchical multiple linear regression (enter method) examined the predictive capacity of MT in relation to eating identity. Each eating identity was separately inserted as a dependent variable in separate analyses. At step one gender and age were entered. All MT subscales were entered at step two. Hierarchical regression is the most suitable method when controlling for other factors (i.e., gender and age; Field, 2009), as well as when the predictor variables entered are correlated with each other (Pedhazur, 1997). The data met the assumptions of hierarchical linear regression (i.e., data were normally distributed, was on an interval scale, and did not display multicollinearity; Field, 2009). One-way within-subject analysis of variance with LSD post hoc test were conducted to identify if there were any significant changes in MT components or eating identities at baseline, three-months, and six-month data collection.

Results

Testing for Normality, Outliers, and Internal Consistencies

There were cases of missing data as weight was only collected at baseline, one-month three-month, and six-months. Missing values resulted in the removal of the participants in line with the inclusion criteria, the number of excluded participants is displayed in Figure 5.1. Data analysis was conducted in SPSS version

22. In total, 1.6% of all cases were removed due to being classified as an outlier (Leys et al., 2013). Tests of univariate normality found all data were within standard limits of kurtosis and skewness (< ± 2). Descriptive statistics are displayed in Table 5.1. MT subscales had good internal consistency (α = .73 to .83) with the exception of emotional control (α = .44). Interim correlation matrix was examined to identify the troublesome items in emotional control. Negative correlations existed between items 26 and 34 which is in line with previous research (Perry et al., 2013), and resulted in the removal of these items. The five remaining items for this subscale had a Cronbach's alpha of .54 and were used as a measure of emotional control in all proceeding analyses. All eating identity scores displayed a good internal consistency (α = .71 to .79) with the exception of meat eating identity (α = .41). Following examination of the interim correlation matrix, item nine was identified as problematic and was removed. This resulted in the Cronbach alpha score approaching a good reliability (α = .63), which reflects the findings of Blake et al. (2013).

Descriptive Statistics

Descriptive statistics are displayed in Table 5.1. Mean MT of the sample (n = 78) was 3.45 ± .40. Following sten calculation, the current sample MT sten score was significantly lower (M *sten*= 4.89; $p < 0.01$) than the general population. The completers (M = 3.45 ± .40) and non-completers (M = 3.36 ± .58, $p > 0.05$) of the study did not display significantly different baseline MT scores. Similarly, no significant difference was reported between the MT of individuals who achieved their target weight (M = 3.62 ± .49), and the MT of the individuals who did not achieve their target weight (M =3.42 ± .38, $p > 0.05$). Completers started with an average weight of 75.16 kg ± 16.14, which did not significantly decrease by the six-

month data collection point (M = 74.95kg ± 16.85, p >0.05). The challenge component of MT significantly decreased between the baseline (M = 3.76 ± .41) and six-month (M = 3.56 ± .56, p < 0.01) data collection. Emotional eating significantly decreased between the baseline (M = 3.35 ± 1.04) and three-month (M = 2.73 ± .34, p <0.01) data collection.

Table 5.1

Descriptive Statistics, Internal Consistency Coefficients of Measured Variables, and the ANOVA's to Compare the Measured Variables in the Study Completers

	Cronbach alpha	Baseline		One month		Three months		Six months	
		M	SD	*M*	SD	*M*	SD	*M*	SD
Overall MT	.93	3.45	.40	-	-	3.48	.43	3.42	.51
Chl	.73	3.76	.41	-	-	3.69	.41	3.56**	.56
Com	.78	3.66	.46	-	-	3.64	.49	3.58	.56
Emo	.54	2.95	.57	-	-	3.06	.60	3.00	.53
Lif	.75	3.50	.49	-	-	3.57	.61	3.53	.64
Abl	.79	3.23	.52	-	-	3.33	.59	3.53†	.64
Int	.83	3.47	.74	-	-	3.54	.62	3.55	.55
Healthy	.79	3.32†	.80	-	-	3.04	.59	3.60†	.81
Emotional	.79	3.35†	1.04	-	-	2.73**	.34	3.13†	1.20
Meat	.63	3.20†	.82	-	-	2.50**	1.07	3.06†	1.13
Picky	.71	2.24†	.76	-	-	2.52	1.01	2.60†	.97
Weight (kg)	-	75.16	16.14	74.57	16.09	75.32*	18.49	74.95	16.85
BMI (kg/m²)	-	26.92	5.70	26.75	5.84	26.53*	6/00	26.70	5.98
WC (%)	-	-	-	-1.23	1.96	-1.69	3.58	-1.30	5.07

Note. Chl = challenge, Com = commitment, Emo = emotional control, Lif = Life control, Abl = confidence in abilities, Int = interpersonal confidence, Healthy = healthy eating identity, Emotional = emotional eating identity, Meat = meat eating identity, Picky = picky eating identity, WC = weight change. * Statistically significant at p < 0.05 from baseline value, † statistically significant at p < 0.01 from three-month value

The baseline weight for the SW sample (M = 98.55 ± 19.46kg) who were classed as obese (M BMI = 35.82 ± 6.53 kg/m²) was significantly higher than the baseline weight for the sample in the current study (M = 75.16 ± 16.14kg) who were classed as overweight (M BMI = 35.82 ± 6.53 kg/m² p <0.01). The baseline MT for the

current sample (M = 3.45 ± .40) was significantly greater than the baseline MT for the participants in Chapter Four (M = 2.98 ± .43; p <0.01). The percentage weight change after the six-month study was significantly greater for the SW sample in Chapter Four (M = 14.23 ± 4.94) compared to the current sample (M = 1.30 ± 5.07; p <0.01).

Bivariate Correlations

Table 5. 2

Bivariate Correlations between Mental Toughness and Eating Identity, and Weight Change

	Overall MT	Chl	Com	Emo	Lif	Abl	Int
WC 1 month	-.07	-.02	-.20	-.10	-.18	-.02	.06
WC 3 month	.07	.27*	.19	-.05	-.11	-.09	.19
WC 6 month	-.21	.05	-.07	-.17	-.20	-.13	.09
Healthy	.08	-.10	.17	.03	.14	-.03	-.03
Emotional	-.30**	-.18	-.28*	-.39**	-.30**	-.28*	-.17
Meat	.06	.16	-.09	.12	.01	.10	.25*
Picky	-.26*	-.09	-.03	-.07	-.20	-.02	-.38**

Note. Chl = challenge, Com = commitment, Emo = emotional control, Life = life control, Abl = confidence in abilities, Int = interpersonal confidence, WC = weight change, Healthy = healthy eating identity, Emotional = emotional eating identity, Meat = meat eating identity, Picky = picky eating identity. * Statistically significant at p < 0.05. **Statistically significant at p < 0.01 *** statistically significant at p < 0.001.

Overall MT was not significantly related to weight change over the six months (r = .21, p >0.05); this was also the case for all subcomponents (Table 5.2). Some baseline MT components were significantly and negatively related to some baseline eating identities; the strongest relationships were between emotional eating and the components emotional control (r = -.39, p < 0.01), overall MT, (r = -.30, p <

0.01), and life control (r = -.30, p < 0.01). The picky eating identity also held a moderate relationship with interpersonal confidence (r = -.38, p < 0.01).

Hierarchal Multiple Linear Regression

Table 5.3

Hierarchical Multiple Linear Regression Analyses for Eating Identity with Mental Toughness

Variable	Step 1 Age, gender	Step 2 Sig. related MT variables
Healthy	Adj R^2 = .06, F (2, 68) = 2.17 Gen β = .15, Age β = -.23	ΔR^2 = .09, F (8, 62) = 1.34 Chl β = 1.18, Com β = .37*, Emo β = .06, Life β = -.01, Abl β = .03, Int β = -.12
Emotional	Adj R^2 = -.02, F (2, 68) = .28 Gen β = .06, Age β = -.06	ΔR^2 = .14, F (8, 62) = 1.34 Chl β = .07, Com β = -.20, Emo β = -.32, Life β = -.06, Abl β = .02, Int β = -.08
Meat	Adj R^2 = .12**, F (2, 68) = 5.86** Gen β = -.23*, Age β = .36**	ΔR^2 = .15*, F (8, 62) = 2.56* Chl β = .09, Com β = -.29, Emo β = .04, Life β = .14, Abl β = .10, Int β = -.31*
Picky	Adj R^2 = .00, F (2, 67) = 1.06 Gen β = .15, Age β = -.07	ΔR^2 = .26*, F (8, 61) = 3.15** Chl β = -.04, Com β = .17, Emo β = .09, Life β = -.19, Abl β = -.35*, Int β = -.60***

Note. Gen = gender, Chl = challenge, Com = commitment, Emo = emotional control, Lif = Life control, Abl = confidence in abilities, Int = interpersonal confidence.
* Statistically significant at p < 0.05. **Statistically significant at p < 0.01. *** Statistically significant at p < 0.001.

Hierarchical multiple linear regressions were conducted to explore the amount of variance MT accounts for in each eating identity (Table 5.3). Consistent with findings of previous work (O'Brien, 2007) there was no multicollinearity evident in the data as all the predictor variables had a Variance Inflation Factor (VIF) of less than five (1.30 – 2.63), and the collinearity statistics exceeded .10 (.38 -.79).

Picky eating was negatively predicted by interpersonal confidence (β = -.60, p < .01) and confidence in abilities (β = -.35, p < .05). Meat eating identity was negatively predicted by interpersonal confidence (β = -.31, p < .05).

Discussion

The third study in this thesis aimed to investigate the relationship between MT, and weight loss and eating identity, amongst individuals who wish to lose weight but are not members of an organised slimming club. As expected, MT was significantly related to healthier eating behaviours (e.g., negatively related to emotional eating). It was hypothesised that MT would be positively and significantly related to weight loss progress, however this was not found. The study offers potential explanations for unexpected findings, and avenues of future research to explore the role of MT in weight loss.

Although this thesis did not aim to conduct an evaluation of the SW service, indicators of potential support from the service were identified. Unlike Study Two, there was not a significant decrease in weight, which offers support for the effectiveness of the SW service. The limited weight loss in the current study could be attributed to a lack of support or knowledge, compared to that which SW members received (Slimming World, 2016). Alternatively, it may be due to the significantly different starting weight between the participants in Study Two (98.55 ± 19.46kg) who were classed as overweight (*M* BMI = 35.82 ± 6.53 kg/m²), and Study Three (75.16 ± 16.14kg) who were classed as obese (*M* BMI = 26.92 ± 5.70). Thus, participants in Study Two had a greater amount of weight to lose. Recording a target to use as a success outcome in the current study was implemented to attempt

using a more relevant success criterion. MT was not significantly different between weight loss target achievers and weight loss target non-achievers.

Hypothesis One: Mental Toughness and Weight Loss

Hypothesis one was not supported, there was not a significant relationship between MT and weight loss. This finding suggests the SW service did not create a ceiling effect in the previous study. Potentially, the lack of a difference between high and low MT individuals may have been due to individuals being capable of losing, gaining, or maintaining weight irrelevant of their MT. Differences between high and low MT individuals may exist between the processes and experiences that one goes through to achieve the outcome weight, as opposed to MT differentiating between the individuals who are successful and unsuccessful. For example, MT is related to achieving goals (Hardy et al., 2013), so if a high mentally tough individual has weight loss as a primary goal they may be more likely to achieve it; however, if other goals took priority (e.g., career goals) then weight loss may not be achieved. Furthermore, if low mentally tough individuals do require support (e.g., external motivation and positive reinforcement to aid their weight loss) they may naturally seek this from other aspects of life such as work or the gym. Therefore, it may not be the end result, but more the process of reaching the end result which is where the difference between high and low MT exist.

A further potential difference between weight loss, and domains that MT has been reported to benefit (e.g., education, sport; Crust, Earle, et al., 2014; Jones et al., 2007 respectively), is the nature of success. Once target weight has been achieved there is the constant process of monitoring and maintaining weight. In contrast, achievements such as a university degree or sporting medal require a high amount of perseverance during work and training, however there is a clear goal in sight and

once it has been achieved it is stable and cannot be taken off the individual (e.g., medal or a degree). Therefore, weight loss is a less stable goal which must always be considered. Furthermore, goals such as education and sport can be avoided by mentally tough individuals (i.e., they may not attend university if they do not hold a goal of achieving a degree), whereas lower MT individuals may drift into situations such as attending university due to their lower level of life control (Strycharczyk & Clough, 2015). Body weight and lifestyle behaviours however, cannot be avoided and the individual must deal with them. Thus, this study extends the current literature, as mentally tough individuals do not necessarily *always* achieve their goals (Connaughton et al., 2010), and low mentally tough individuals can successfully achieve their goals.

The average baseline MT for the current sample was significantly below the mean of the population, however, it was significantly higher than the average MT for study Two. This may be due to the current sample having less failed attempts at weight loss, whereas the sample in Study Two may have experienced more setbacks that they did not cope with effectively. The less effective coping may have resulted in a decrease in MT components (e.g., confidence), and led to joining SW. The greater number of setbacks can decrease self-efficacy (Bandura, 1989), which can have negative effects of MT due to the positive relationship between the two individual differences (i.e. MT and self-efficacy; Clough et al., 2002). Therefore, those with a lower MT may be more likely to join a support group due to their lower self-efficacy towards weight loss. In contrast, those with a higher MT would be expected to be able to bounce back more easily and overcome the setback (Cook et al., 2014), thus would have less reliance on a support group.

Overall MT did not significantly change over the course of the six months amongst the current sample, which could be attributable to the lack of SW support that teaches skills such as problem solving and behaviour monitoring that are associated with MT (Kaiselar et al., 2009; Clough & Crust, 2011). This offers further support for the effectiveness of the SW service, as enhanced MT can benefit life domains such as education (Crust, Earle, et al. 2014) and business (Marchant et al., 2009). The non-significant decrease in weight may offer explanation as to why MT did not significantly change in the current study. If weight loss is not achieved, individual characteristics that can be enhanced through achievement and that are related to enhanced MT (e.g., self-efficacy; Clough et al., 2002) may not have increased. The significant increase in MT following the SW support (Study Two) demonstrates that with a suitable environment interventions can enhance MT.

Additionally, a non-significant change in MT over the six months supports the stability of the trait (Hardy et al., 2013), which contrasts previous work (Gucciardi et al., 2015). Potentially Gucciardi et al. may have reported differences due to the sample being university students who are experiencing a challenging time, and thus learn coping resources which enhance MT. This may also have been the case in Study Two whereby individuals were receiving support and learning new skills, which enhanced their MT. This study involved a sample of people who were not all experiencing a critical life period, or attending a structured support to learn new skills related to weight loss, which may explain why MT did not significantly change.

Hypothesis Two: Mental Toughness and Eating Identity

Support for hypothesis two was provided. Some MT subcomponents were significantly related to eating behaviours. Emotional eating identity was most

strongly related to the MT subcomponent emotional control. Theoretically this makes sense, as mentally tough individuals have control over their emotions and keep their anxieties in check (Strycharczyk & Clough, 2015), therefore will be less reliant on external sources such as food to relieve stress (Gibson, 2006). This demonstrates strengthening MT components can enhance eating behaviour.

Strengths, Limitations, and Future Directions

Strengths. A strength of this study was that it provided a comparable sample to Study Two, which enables the effect of not having organised support for losing weight to be explored. Additionally, the study started in January 2015, which was in line with the previous study (January 2014). A further strength was the longitudinal design of the study, which allowed patterns in change (i.e., weight loss) to be assessed over time, enabling a more complete data interpretation than cross-sectional designs (Howitt & Cramer, 2005). Investigating whether participants met their target weight, as well as percentage weight change, in relation to MT allows the success of participant to be monitored; potentially some participants may have lost 1% of their body weight and achieved their target, whereas others may have lost 5% of their body weight and did not achieved their target.

Limitations. One limitation of the study was the self-report data collection of weight. A common issue associated with self-reported weight was providing values lower than actual body weight, more specifically weight loss samples have been reported to under-report weight (Gorber et al., 2007). Under-reporting weight may be due to social desirability. This decision to use self-reported weight was made to ensure that participants had minimal contact and communication with the researcher, to reflect a ‘go at it alone’ weight loss attempt as opposed to having someone to monitor their weight and provide support. An additional problem relating to body

weight was that one of the participants, following the deletion of outliers, was classified as underweight (BMI = 17.85; underweight BMI = <18; NHS, 2016e). It is questionable whether this individual should actually want to lose weight, and potentially may have affected the results due to only being able to lose such a small percentage of body weight. A final limitation, as discussed in the previous chapter, was the female heavy sample.

Future directions. Future work could expand from the initial quantitative studies which have been presented in this thesis by combining them with qualitative methods, for example, in mixed-methods research. Mixed-methods research can provide a more complete answer to the main aims of this thesis, as the gaps left by one approach can be answered through alternative methods (Bryman, 2015).

Applied Recommendations

The current study identified that components of MT are significantly related to eating behaviours, mainly emotional eating, which suggests that components of MT related to eating identities should be targeted. For example, emotional control, characterised by higher calorie intake and lower fruit and vegetable components, held the strongest relationship with emotional eating. Strategies to enhance one's coping ability to deal with stress and emotions may be one way to enhance MT and increase healthier eating, which in turn may enhance weight loss. Furthermore, if individuals are not receiving support it may be difficult to enhance their MT, however the environment can be modified. For example, having healthier food more readily available and promoting it to make the food seem less *alien* (Mottus et al., 2013), so those with a lower MT do not view healthy and alternative foods as a threat and are more likely to consume a healthy diet.

Conclusion

This study assessed the third research objective in this thesis. MT was not significantly related to weight loss which suggests that SW did not create a ceiling effect in study Two, and MT cannot predict weight loss achievement. MT was found to be significantly related to eating behaviours, particularly emotional eating, which displayed increased MT may improve eating behaviours. At this point in the thesis, it appears that MT may not differentiate between the successful and unsuccessful individuals within the weight loss domain, and MT may play a different role in the HRLF domain compared to previously researched areas (e.g., sport, business). Potentially MT may not influence the outcome of an individual's weight loss progress, but may influence the journey which the individual experiences. For example, low mentally tough individuals may seek more external motivation, whereas higher mentally tough individuals have greater intrinsic motivation (Gucciardi et al., 2008). Therefore, interventions supporting weight loss cannot be generalised, and tailored support based on individual differences (e.g., MT) appears appropriate.

Chapter Six – Study Four: A Mixed-Methods Investigation of High and Low Mentally Tough Individuals Pursuit of a Weight Loss Goal

Introduction

The central tenet of this PhD is that theoretically, behaviours associated with MT would benefit weight loss achievement. However, significant relationships were not reported in Chapters Four and Five, suggesting this association appears more complex than expected. Indeed, an important question that has emerged is "why does MT not display a significant relationship when pursuing a weight loss goal, despite being significantly related to goal attainment in other domains?" A different perspective may be required to gain a further insight into the complex relationship between MT and weight loss. Therefore, this fourth study aimed to combine qualitative *and* quantitative methods to explore the processes, experiences, and perceptions of high and low mentally tough individuals when trying to lose weight.

Chapters Four and Five presented descriptive studies that displayed MT was not significantly related to success in the domain of weight loss. Commensurate with previous work (e.g., Stubbs et al., 2012), which has effectively explored weight loss quantitatively, Chapters Four and Five did not capture *why* or *how* the individual was successful or unsuccessful. To extend this line of enquiry, and overcome the limitation of each methodological approach, qualitative *and* quantitative methods could be combined in a mixed-methods study with the aim of providing further and more in-depth insights to offer a more holistic understanding of the matter (Moran, Matthew & Kirby, 2011). Employing complementary methods allows the drawbacks of the two approaches to be counterbalanced, and the research can draw on the strengths of each method (Bryman, 2015) to provide richer information than a single method alone (Moran et al., 2011). In this case the gaps left by the quantitative data (i.e., participants' experiences between starting the study and their final weight, and

factors which influenced their weight change) can be explored through qualitative enquiry.

Researchers have explored weight loss by grouping similar participants together, for example based on quantitative outcomes (e.g., weight loss maintainers compared to weight loss re-gainers; McKee et al., 2013) who were then interviewed. Alternatively, it may be beneficial to group people based on individual differences. To demonstrate the potential benefit of mixed-method research in the context of the present study, the quantitative methods could enable high and low MT individuals to be sampled (assessed quantitatively via the MTQ48) for a qualitative phase; qualitative investigation of the two groups (i.e., high MT and Low MT) could enable exploration of the unique characteristics, experiences, and reported behaviours during the participants' pursuit of a weight loss goal. For example, investigating barriers and facilitators of weight loss from the perspective of information-rich cases (Sparkes & Smith, 2014). This can help achieve an in depth understanding of high and low mentally tough individual's experiences of working towards a weight loss goal. Interviewing participants following the data collection of the current six-month longitudinal study will allow the experiences of the participants to be aligned with their quantitative results offering a more holistic approach. The mixed-methods approach may provide a richer understanding, and gain further insight into the factors influencing the relationship between MT and weight loss.

Previous qualitative research has focused primarily on high mentally tough individuals (e.g., Bull et al., 2005; Jones et al., 2007), those with a low MT appear an under investigated group in relation to the pursuit of a goal. Gucciardi et al. (2008) proposed the characteristics of low mentally tough individuals based on the opposites of high mentally tough participants' responses during interviews (e.g.,

resilience versus. fragile mind set; self-belief versus self-doubt), yet low mentally tough participants were not included in their study. Earlier qualitative work in the MT domain (e.g., Jones et al., 2007) consisted of interviews that focused on describing the ideal mentally tough individual, this approach generated unrealistic criteria (Andersen et al., 2011). Potentially, gaining an insight into the high and low mentally tough individual's perceptions and experiences would help create a clearer and more insightful account of their pursuit of a weight loss goal (e.g., barriers, facilitators). Therefore, the benefits of exploring low MT individuals' experiences of pursuing a weight loss goal are twofold: 1) it can offer a potential avenue for providing individualised weight loss support; 2) it offers an opportunity to add to the MT literature which predominately investigates high MT individuals.

Moreover, previous work has grounded the participant sampling criteria on observation of *mentally tough behaviours,* which were most commonly based on success (e.g., Jones et al., 2007). Studies Two and Three demonstrated that such a selection criterion cannot be applied within the weight loss domain due to the lack of a relationship between MT and weight loss success. Considering the ability to quantify MT (e.g., via questionnaires), quantitative sampling of participants (e.g., using the MTQ48) can avoid relying on the assumption that MT is related to success. Quantifying MT may increase confidence that participants with a high and low MT were sampled.

Study Aims

By employing a mixed-method approach this study aimed to explore if there are differences in the perceptions and experiences of high and low mentally tough individuals in the pursuit of a weight loss goal. This study sought to provide an insight into factors influencing the relationship between MT and weight loss, and

offer tentative explanations as to why MT and weight loss are not significantly related. Conducting this study will contribute to addressing research objective four (i.e., investigate the experiences and perceptions of high and low MT individuals).

Method[4]

Research Design

Mixed-methods research combines different methods of collecting and/or analysing data in a single study to enhance understanding of a phenomenon, and offer a more holistic, in-depth approach (Braun & Clarke, 2013; Moran et al, 2011). This study used an explanatory sequential participant-selection design (quant → QUAL; Creswell & Plano Clark, 2011). Firstly, the quantitative assessment of MT in phase one enabled purposive selection of participants, by quantitatively sampling high and low MT participants (based on MTQ48 scores). This approach avoided the assumption that success implies a high level of MT, which as demonstrated in Studies Two and Three is not the case within the weight loss domain. The second, but primary, phase involved the use of semi-structured interviews to explore participants' experiences of pursing their weight loss goal. The interviews enhanced understanding of the lived experiences of participants (Bryman, 2016), as well as gaining a rich and detailed account of their experiences and perceptions of trying to lose weight (Braun & Clarke, 2013). It is the qualitative phase that this chapter focuses on in the method and results, the quantitative phase method and results were reported in Chapters Two and Three and are only discussed in relation to describing the participants (e.g., weight, MT, weight loss) throughout this chapter.

[4] The methods discussed in this chapter are focused on the qualitative aspect of this study, with a brief overview of the relevant quantitative method that was used for participant sampling. The quantitative phase of this study is discussed in full detail in Chapters Four and Five.

Participants

Table 6.1

Description of the Participants

Participant number	Age	Gender	BMI (kg/m²)	MT score (Sten)	MT group	Study	Last recorded weigh in (week)	Weight change at last weigh in (%)
1	38	Female	35.31	1.63 (1)	LMTG	Two	24	-6.42
2	64	Female	35.48	1.91 (1)	LMTG	Two	3	+3.86
3	41	Female	35.68	2.11 (1)	LMTG	Two	16	+6.76
4	25	Female	27.51	2.61 (1)	LMTG	Three	24	-4.05
5	38	Female	23.72	2.83 (2)	LMTG	Three	24	+2.08
6	34	Female	30.90	2.93 (2)	LMTG	Three	24	-1.58
7	29	Female	29.34	3.13 (3)	LMTG	Two	24	+3.68
8	67	Male	21.29	3.93 (7)	HMTG	Three	24	0
9	37	Female	30.95	3.95 (7)	HMTG	Three	24	-.54
10	23	Female	23.53	3.96 (7)	HMTG	Three	24	-5.37
11	24	Female	22.53	4 (8)	HMTG	Three	24	-1.20
12	50	Female	30.80	4.17 (8)	HMTG	Three	24	+2.27
13	71	Male	41.59	4.24 (9)	HMTG	Two	24	-19.45
14	25	Male	26.99	4.39 (9)	HMTG	Three	24	-7.69
15	45	Female	28.38	4.57 (10)	HMTG	Three	24	+7.65
16	58	Female	34.61	4.70 (10)	HMTG	Two	24	-19.27

Intensity sampling was used to purposely select information-rich cases (Patton, 2015). This approach enabled the process of pursuing a weight loss goal amongst high and low mentally tough individuals to be explored. Phase one, the quantitative element, involved sampling of participants from Studies Two (n = 6) and Three (n = 10) based on their MTQ48 scores, and their weight being tracked

over six months. The sample included three males and 13 females, aged between 23 and 71 years old (M = 40.56 ± 14.88).

Phase two inclusion criteria ensured participants had a high (n = 9) or low (n = 7) MT score, assessed through their MT sten (see below). Nine participants gained weight, six lost weight, and one maintained the same weight. Participants were from the UK (n = 14), Republic of Ireland (n = 1), or New Zealand (n = 1). Table 6.1 presents a summary of the participants.

The Interviewer

At the time of the first interviews, the interviewer was a 23-year-old female PhD student. The researcher had not previously attended a weight loss club, but was conscious about being physically active and consuming a healthy diet to maintain a healthy weight.

Procedure

Ethical approval was received from the relevant university ethics committee. The main considerations were maintaining confidentially, as well as the participant being aware that the interview could be terminated at any time which is important when discussing sensitive topics (i.e., eating disorders, depression). All participant information sheets and transcripts were stored in a locked cabinet inside of a secure office. Following the interview participants were provided with a debrief to outline the nature of the study and provide contact detail of the lead researcher. The quantitative phase involved completing the MTQ48 to assess MT and the participant's weight being monitored over a six-month period. The MTQ48 scores provided a basis for the sampling criteria in the qualitative phase. A MT sten[5] of 1-3

[5] Note: MT score of ten (sten) indicates the participants approximate position of their MT in relation to the MT of the general population. The scores range from 1 (lowest

was recognised as having a low MT, and sten 7-10 was regarded as having a high MT. The low MT participants formed the low MT group (LMTG), and the high MT participants formed the high MT group (HMTG). Participants who met the inclusion criteria (grouped as high or low MT, and who had provided permission to be contacted in phase one) for the qualitative phase were contacted via e-mail. The e-mail provided an invitation to participate in the interview, as well as signalling the offer of a £10 Amazon voucher for participation. Participants from Study Two were contacted via e-mail by SW and were provided with the e-mail address of the researcher to contact should they wish to participate. The participants from Study Three were contacted via e-mail directly from the researcher inviting their participation.

Data were collected until data saturation was deemed to have been reached (Cote, Samela, Baria & Russell, 1993). A reduced number of emerging themes appeared after the 12th interview, which is analogous to previous work (e.g., Guest et al., 2006). Four further interviews were conducted, two with each group, after which data saturation was deemed to have occurred as no new themes emerged. It was considered important that participants selected their preferred method of communication as it has been noted that some participants may disclose sensitive information (e.g., weight issues) via a telephone interview, which they may be reluctant to discuss in a face-to-face interview (Sparkes & Smith, 2014). Due to participant preferences, interviews were face-to-face (n = 9), telephone (n = 4), or electronic (e.g., skype; n = 3). The researcher sought to establish rapport prior to

MT scores) – 10 (highest MT scores) with a mid-point score of 5.5. in this study, sten 1-3 = low MT, STEN 3.1-6 = mid MT, sten 6.1-10 = high MT. A set range of MT scores is represented by a set sten score (e.g., MT score 1 – 2.71 is represented by sten 1). Sten scores were discussed in more detail in the Methods to Investigate Mental Toughness (p. 35)

interviews, particularly telephone interviews, as the lack of visual cues available with telephone interviews can compromise rapport (Sparkes & Smith, 2014). Rapport was thus developed initially through e-mail correspondence and an informal chat before the interview began (Ryan & Dundon, 2008). The face-to-face interviews were conducted in a private room on a university campus, while all other methods of communication were conducted with the researcher on the university campus and the participant in a location of their choice. Interviews lasted on average 63 ± 14.04 minutes and were digitally recorded and transcribed verbatim by a combination of the researcher, and a trusted transcription company that complied with the ethical standards for the study.

The Semi-Structured Interview

A semi-structured interview was used to elicit the data according to a general interview guide (Patton, 2015), while also allowing participants to discuss their feelings and ideas on areas of perceived importance from their own perspective (Sparkes & Smith, 2014). The interview guide (Appendix L) cohered around exploring participants' experiences of trying to lose weight by making lifestyle modifications. Participants were first asked an introductory question (Kvale, 1996), which explored how long they had wanted to lose weight, and their motivations for weight loss. Subsequent questions elicited factors and strategies that influenced commitment towards leading a healthy lifestyle, reasons for setbacks, responses to deviations from plans or missing goals, and changes in confidence and perceptions when pursing a weight-loss goal. The interview concluded with exploring participants understanding of MT in relation to leading a healthy lifestyle. Development and emergence of other themes was encouraged through open ended questions, such as "Can you tell me about any times you displayed commitment to

leading a healthy lifestyle?" A combination of detail-orientated probes (e.g., "how did that make you feel?"), elaboration probes (e.g., "can you give an example of when that happened?"), and clarification probes (e.g., "What do you mean by that?") were utilised to gain a rich understanding and deeper insight into the participants' experiences commensurate with qualitative approaches (Sparkes & Smith, 2014).

An interactional approach throughout the interviews encouraged a conversational and informal style which developed rapport (Potter & Hepburn, 2005), and encouraged the development of new themes emergent from the interaction (Lincoln & Guba, 1985). The interview was piloted on two female participants aged 23 years old who both lost weight (M = -4.38% of initial body weight). The first pilot interview resulted in the use of additional probes to gain deeper understanding of the participants' experiences. Data from the second pilot interview (participant HMT10) were deemed to be of sufficient quality for inclusion in the study due to the utilisation of the additional probes.

Data Analysis

An inductive thematic analysis was employed to enable the emergence of new themes from the data (Sparkes & Smith, 2014). The analysis process followed a procedure similar to the six-stage process outlined by Braun and Clarke (2006). Data immersion was achieved through a process of "in-dwelling", which involved repeat readings of the transcripts (Maykut & Morehouse, 1994). The remaining stages of Braun & Clarke (2006) steps involved identification of initial codes in the data that appeared relevant to the aims of the study. Similar codes were then grouped together to form sub-themes. After the sub-themes were reviewed and refined at the level of coded data extracts and the entire data set, sub-themes were grouped into themes. The sub-themes and themes were created to reflect the salient perceptions and

experiences of high and low mentally tough individuals during their pursuit of a weight loss goal.

Establishing Trustworthiness

It has long been argued that traditional evaluation criteria specific to quantitative research are not relevant or appropriate regarding qualitative research (Allen-Collinson & Hockey, 2005; Sparkes & Smith, 2014). Some qualitative researchers have used the criterion of trustworthiness to judge the "quality" of qualitative research (Sparkes & Smith, 2014), and this was deemed an appropriate criterion for this element of the current study. Trustworthiness was sought via several steps. *Peer debriefing* occurred in regular meetings between the researcher and supervisors who provided ongoing guidance and sought to challenge the researcher's pre-suppositions and assumptions (Creswell & Miller, 2000). Peer debriefing occurred in formal group meetings, as well informal meetings with each supervisor individually. Additionally, "critical friends" (e.g., supervisors, peers) offered feedback and critiqued the results of these processes (Smith & Caddick, 2012), whilst maintaining anonymity of interviewees. A summary of findings was emailed to participants as a form of member checking, a separate summary report was produced for the HMTG (Appendix N) and LMTG (Appendix P). This process provided the opportunity to ask participants if the findings made sense to them, and were reflective of their own experiences. Thus, the researcher sought to confirm as far as possible that the raw data had not been misinterpreted (Braun & Clarke, 2013). Summary reports were well received, participants expressed their interest and no changes were requested during this process.

Results and Discussion

This section presents the themes that emerged from the inductive thematic analysis, using verbatim quotes to 'give voice' to the participants. Initially, a deductive approach was adopted and the data were coded using the framework of the 4C's model and previous literature. It transpired that the data did not appear to fit such as framework, and an inductive approach appeared more appropriate to represent the participants' views, which appeared somewhat contradictory to previous work into MT and areas such as business and sport. Consistent with the main aims of this study, an overview of key characteristics and behaviours of high and low mentally tough individuals' pursuit of a weight loss goal are presented. The analysis revealed seven themes: goals; control; social support; motivation; coping mechanisms; perceptions of weight loss; and confidence (see Table 6.2). These themes are discussed in terms of sub-themes (*italicised text*), and direct quotes from the raw data are used throughout to illustrate. A combined results and discussion is presented, so the data could be discussed in relation to existing literature, and to provide tentative explanations for the relationships reported in Chapters Four and Five. Whilst these themes are discussed separately, it is acknowledged there are inter-relations; for example, extrinsic motivation can be provided through social support. To retain anonymity and enable a clear distinction between the HMTG and LMTG, each participant is represented as a code and number: LMT1-LMT7 represents the LMTG and HMT8-HMT16 represents the HMTG.

Goals

Setting goals is a facilitator of weight loss (Rogerson et al., 2013) and weight loss maintenance (McKee et al, 2013), as well as being recognised as an important MT characteristic in qualitative (Crust, Swann, et al., 2014) and quantitative work

(Crust & Azadi, 2010). The theme goals appeared important for differentiating between successful and unsuccessful weight loss success amongst the HMTG; other themes were more important in differentiating between successful and unsuccessful weight loss in the LMTG. This theme captured the differences in goal orientation. Goal orientation was based on one's definition of competence and success (Nicholl, 1989). Determining success in normative terms (e.g., winning) represents ego goal orientation, whereas task goal orientation refers to appraisal of one's competence and success (e.g., personal improvement). This theme consisted of four sub-themes for the HMTG and two sub-themes for the LMTG.

HMTG. The HMTG held *clear goals,* which can facilitate adopting healthier behaviours (McKee et al., 2013): "I had a target weight that I wanted to achieve, which I achieved in, I think it was last November" (HMT12). All HMTG participants discussed possessing the ability and skill set to *achieve valued goals,* which were reported to be in a variety of domains (e.g., career, hobbies, and weight loss). Goal achievement was potentially due to their determination, commitment (Cook et al., 2014), and behavioural perseverance (Gucciardi et al., 2016) towards goals of perceived importance. The mentally tough individuals appeared to have similar underlying "tough attitudes" to their prioritised goals, which was characterised in Bull et al.'s (2005) pyramid of MT as having a "never say die" and "go the extra mile" mind set. The HMTG held a fluid structure of priorities: "if like you're studying for your PhD, you know you have to get there and everything else [healthy behaviours] will probably take a back seat. And that's how I suppose my life has been for a long, long time" (HMT12).

Table 6.2.

Themes of High and Low Mentally Tough Individuals Pursuit of a Weight Loss Goal

LMTG			HMTG	
Example quote	Sub-theme	Theme	Sub-theme	Example quote
I've never had like a specific weight number that I want to aim for (LMT4)	Unclear goals	Goals	Clear goals	I had a target weight that I wanted to achieve, which I achieved in, I think it was last November. (HMT16)
I'd be happy to have it [slimmer of the week] and be the winner, but I haven't got the motivation to actually do what I should be doing (LMT2)	Ego orientated goals		Task orientated goals	I did it [lost weight] to increase my performance (HMT11)
			Ego orientated goals	I'm like oh well I can't let him be more ripped that me (HMT14)
			Achieve valued goals	If like you're studying for your PhD, you know you have to get there and everything else [healthy behaviours] will probably take a back seat (HMT12)
He's a sabotage (LMT7)	External locus control	Control	Internal locus of control	I'm in control of what I eat and what I do (HMT9)
If I open a packet of biscuits I've got to eat them all, I can't have one (LMT2)	Loss of control		Remain relatively in control	I'm very privileged in having a reasonable amount of control (HMT8)
If I have a plate of fruit or something put out, chopped fruit…on the table to pick at, then I won't actually eat a lot of food afterwards (LMT1)	Strategies to gain control		Rapid regain of control	Forget about Slimming World for the day and it was fine. Then the next day you go back onto it [slimming world plan] and there you are (HMT16)
I felt like I'd sort of took back the control (LMT1)	Growth in control			
Admittedly though, I don't have many friends (LMT3)	Gap in social support	Social support	Informational support	So I think those facts, for me, are really, really useful (HMT 16)
She wanted to find someone who would go swimming with her and I wanted someone (LMT2)	Seek support		Little reliance on social support	In terms of the workout stuff, again I'm happy to do that sort of on my own or with other people (HMT14)
it is easier when there's other people going (LMT6)	Companionship support		Require support	I attend a slimming club weekly (HMT16)

And in an ideal world I'd also have someone to cook food for me to make sure that I did eat the healthy things (LMT4)	Desire for further support			
People started really to notice that I'd lost a lot of weight as well…the more encouraged I was…I sort of picked the activity levels up from there (LMT4)	Praise from others	Motivation	Enjoyment	It's kind of like stuff that I do enjoy doing I will continue doing (HMT10)
You get little stickers…it sounds silly but they are actually quite motivating (LMT1)	Stickers and certificates		Self-improvement	And that for me was a kind of trigger that I had to get fitter (HMT11).
I tend to go for the comfort food (LMT6)	Emotional eating	Coping mechanisms	Emotional eating	If I am feeling shit…I'll just have pizza and some sweets (HMT14)
So I will just wear like loser clothes…saves me going to the gym (LMT4)	Problem avoidance		Problem focused coping	Sometimes I think…what triggered me into having something to eat (HMT12)
I think my mind just immediately has this perception thing, it's immediately negative (LMT5)	Negative perceptions	Perceptions of weight loss	Positive perceptions	It was a challenge I was looking forward to (HMT14)
I had struggled with things like time constraints and working schedules (LMT4)	Perceived barriers		Perceive barriers as solvable	I think I'm kind of like working my way back into a routine now (HMT14)
Maintaining the normality rather than going too far...I can't get that (LMT7)	Dichotomous thinking		Realistic perspective	Like if I want to have an ice cream, I'll have an ice cream. (HMT11)
If I had all the options in the world. I wouldn't actually be confident to make the best decisions (LMT4)	Low confidence in abilities	Confidence	Confidence in abilities	I was quite confident I would do it [lose weight] (HMT16)
Whereas now I've got that confidence, I will actually go into a gym (LMT2)	Confidence growth			
I don't like the gym…it is full of people who are fitter than me" (LMT3).	Upward social comparisons			

It emerged that most of the HMTG who lost weight either had additional motives for adopting new behaviours or valued weight loss. Participants discussed numerous reasons for why they wanted to lose weight: "Oh I wanted to be fitter, I couldn't do anything. It was hard getting up off the settee, I couldn't walk the dog, my knee was hurting, I was getting breathless all of those things" (HMT16).

Placing value on a goal enhances the belief, attitudes, and intentions towards the goal (Hutchinson, Johnston & Breckon, 2014), which may explain the unsuccessful weight loss in the HMTG who did not view weight loss as a priority. This proposition is congruent with work on mentally tough exercisers, who made sacrifices to achieve important goals such as regular attendance at gym classes (Crust, Swann, et al., 2014). Those in the HMTG who did not have additional motives and expressed other prioritised goals (e.g. hobby, career, family) were predominantly unsuccessful at losing weight and achieved their prioritised goals, which offers further support for goal value to play an important role amongst the HMTG:

> If I'm under a lot of stress and I come home and I know I have to do X, Y and Z first in order to meet my other goals, I then don't have that time for preparing food or thinking about my food plan and shopping. So I would then just have anything to eat that was there; I would just shop whatever I could get. (HMT12)

> My hobby is that I'm a writer. I had a book published, I don't know, last year and I've got another one that I'm halfway through. All I want to do is sit and write and so the time that I have to go out and run about, when I can't do

> those things, I find quite frustrating. I know I have to do it [exercise], but I don't want to do it because it stops me doing what I do want to do. (HMT15)

It appears that exercise and preparing food takes time away from what the individuals wants to do, and achieving their important goals. To successfully change behaviours, Crust, Swann, et al. (2014) proposed personal time to exercise must be prioritised over other commitments (e.g. career, family) to establish and maintain exercise as a habit.

Some of the HMTG who were not successful at weight loss, and did not perceive weight loss as important, demonstrated their ability to succeed at lifestyle changes that they prioritised:

> It's the same as when I quit smoking. You can tell me as many times as you want about how bad smoking is for me…I know this. I'm a scientist. But it wasn't until I said, 'You know what, I need to stop,'…and it worked…I knew I wanted to do it…It was a rough couple of weeks but I got through it because I knew that was what I wanted to do. (HMT9)

Achieving a goal grounded on beliefs of importance reflects elements of the HBM, which is based on the individual beliefs and attitudes, and proposes that the individual implements the behaviour if the benefits are believed to outweigh the costs. Goal hierarchies may offer an explanation to this, as some of the successful HMTG individuals referred to having proximal goals that assisted their achievement of distal goals, as opposed to purely the distal goal or unclear goals of wanting to lose weight (Masuda, Kane, Shoptaugh & Minor, 2010). The mentally tough individuals may benefit from the importance and associated benefits of leading a healthy lifestyle and losing weight being promoted. This may alter their attitudes and

perception of weight loss and healthy behaviours. Once the healthier behaviours are perceived as important this can enhance their intentions to lead a healthy lifestyle, and amongst mentally tough individuals' intentions can predict their actions (Gucciardi, 2016).

Task orientated goals were described by a number of the HMTG for their prioritised goals: "to increase my performance…I felt in a couple of games towards the end of last season that I wasn't fit enough… that was one thing that I could work on going forward" (HMT11). Some of the HMTG also adopted *ego orientated goals*, and held the desire to be better than their peers: "My friend is losing weight…he used to be quite fat and now he's lost quite a lot of weight...so he's like oh I'm going to be ripped soon. I'm like oh well I can't let him be more ripped that me" (HMT14). A combination of task and ego orientated goals amongst mentally tough individuals is congruent with Jackman, Swann & Crust (2016). Thus, the HMTG individuals who did not prioritise or value changing their behaviours to lose weight may benefit from strategic goal setting, with a combination of task orientated (e.g., learning a new sport that has skills to be mastered), and ego orientated (e.g., compete against others) goals. This is congruent with characteristics of mentally tough exercisers who wanted to progress their skills, but were also competitive with other class members and exercise leaders (Crust, Swann, et al., 2014).

LMTG. Goals did not appear as an important theme for the LMTG compared to the HMTG. The LMTG expressed a combination of weight loss being high up and low down their priority list, however this did not appear to influence the likelihood of the weight loss goal been achieved. Most of the LMTG held *unclear goals*, as demonstrated by participant LMT4: "I've never had like a specific weight number

that I want to aim for". MT has a significant positive relationship with goal setting (Crust & Azadi, 2010), thus it appears the LMTG may require assistance setting clear goals (e.g., SMART goals; see Locke & Latham, 1990), which has been found to increase the number of daily steps (Mann et al., 2016) and facilitate weight loss maintenance (McKee et al., 2013).

Most of the LMTG adopted *ego orientated goals*: "I'm always very envious of those wonderful people that can walk in [to the slimming club] and go, I've lost six pounds today. I think 'I want to smash your face in'" (LMT3). The ego goal orientation indicates that these individuals liked to be successful, however they were not as concerned with self-improvement. Thus, setting goals whereby the individuals can beat others is suitable, however this can be difficult if the individual is not the best at activity. It may be necessary for the LMTG to transform their goal orientations to being more task focused, so a sense of achievement can still be gained.

Control

A high level of control is a characteristic of MT (Cook et al., 2014), and is important in terms of increasing physical activity levels (Cobb-Clark et al., 2014), consuming a healthy diet (Rogerson et al., 2016), and successful weight loss (McKee et al., 2013). The control theme referred to the extent that the individual was in control over their lifestyle choices, and their locus of control. Control appeared one of the most distinguishing factors between successful and unsuccessful weight loss for the LMTG. Three sub-themes were identified for the HMTG and four sub-themes for the LMTG.

HMTG. The HMTG held an *internal locus of control* and felt responsible for their behaviours and ultimately their destiny: "I'm in control of what I eat and what I do" (HMT9), which corroborates with previous MT research (Cook et al., 2014). Intuitively, it would be expected that mentally tough individuals were predominantly in control of their lifestyle choices, enabling them to remain focused and undistracted from unhealthy behaviours. Self-control assisted some of the HMTG to lead a healthy lifestyle, in contrast having self-control could result in the individual setting out to achieve their less healthy intentions to satisfy one's needs. For example, participant HMT15 was intolerant to chocolate, yet wanted her craving of chocolate to be satisfied: "I actually developed my own chocolate recipe (laughs) this was how desperate it was" (HMT15).

The HMTG appeared to *remain relatively in control* and satisfy internal needs, however there were less frequent occasions when the HMTG would decide to go off the plan. The deviation from plan was followed by a *rapid regain of control* by most of the HMTG: "Forget about Slimming World for the day and it was fine. Then the next day you go back onto it [Slimming World plan] and there you are" (HMT16). The rapid refocusing corroborates with the conclusions of Bull et al. (2005). The HMTG were predominantly in control of their choices, which can result in either healthy or unhealthy behaviours depending on their personal needs and values.

LMTG. Control emerged as one of the key factors that differentiated between the successful and unsuccessful LMTG participant's weight loss. Most of those who successfully lost weight discussed strategies that enabled low levels of control to be circumnavigated. In line with the TPB (Ajzen, 1988), increasing one's

sense of perceived control can enhance intentions, which in turn can increase the likelihood of healthy behaviours. Initially, the LMTG discussed their low levels of control, and once they had lost control and gone off track from their healthy behaviour plans it was difficult to rebound: "It was very easy to slip [off the eating plan], but once I'd slipped it was very easy to stay here rather than trying to get back onto the diet again" (LMT6). Most of the LMTG were unable to regain focus following a setback and their behaviour would continue in a downward spiral. Participant HMT4 stated: "It's kind of like once you've got a blemish on your nice clean slate it's kind of ruined. It kind of gets worse from there." This is parallel to the Gucciardi et al. (2008) who reported low mentally tough individuals to be distractible and unfocused.

An *external locus of control* initiated the majority of the LMTG to go 'off track'. For example, they felt influenced by factors such as other people who acted as a "sabotage" (LMT7), by tempting them with food:

> He [her husband] always says he's trying to be healthy, but to be honest, he's a sabotage… He'll say, 'You're not having these biscuits; I'm going to sit here and eat them in front of you,' and then I get cross and take biscuits off of him and eating them myself. (LMTT7)

Being distracted by temptation stands in contrast to the characteristic of a high mentally tough individual (Cook et al., 2014). Thus, it appears important to assist the LMTG in learning strategies to enhance their control around distractions.

Specific situations could initiate a *loss of control*: "If I open a pack of biscuits I've got to eat them all, I can't have one (LMT2). The loss of control appeared to be combatted by some LMTG participants adopting appropriate

strategies to overcome low control: "If I have a plate of fruit or something put out, chopped fruit…on the table to pick at, then I won't actually eat a lot of food afterwards [being at the pub]" (LMT1). Similarly, LMT4 stated: "So I constantly crave that [junk food] and I try to combat that by being careful about when I went to the supermarket, because I'm more and less careful at different times, so I try to go at times when I wouldn't buy all that extra stuff" (LMT4). Levels of self-control did not appear to have been enhanced, however the opportunity to become distracted and lose focus on their goals was reduced (e.g., searching through the cupboard that contains unhealthy food). Teaching low mentally tough individuals strategies to restrain behaviour appears important due to their low levels of control.

By adopting strategies to avoid losing control participants experienced a *growth in control.* Participant LMT1 discussed how initially she felt no control over her behaviour, however following attending the SW service a sense of control was gained:

> I think that to start with I felt…out of control. I definitely felt out of control when I wasn't dieting and when I joined Slimming World I didn't really know what to expect and I just sort of – I felt like I handed over control to them for a bit. And gradually… I felt like I'd sort of took back the control so that if a particular event was coming up and I knew that it might present a challenge for me that I could do things to mitigate what was going to happen. And, yeah…I would say that I had no control to start with and then I gradually felt like I was getting that handle on it and the control came to me over time. (LMT1)

It is promising that individuals can adopt strategies to overcome low levels of control, which appears a crucial component in weight loss (McKee et al., 2013).

Adopting these strategies to enhance control, alongside interventions to enhance the MT component control, may result in more effective and sustained behaviour change.

Social Support

All participants relied on social support throughout the pursuit of their weight loss goal. Social support was reported by both groups, however the LMTG appeared to have greater reliance on receiving support. Social support can facilitate weight loss (Rogerson et al., 2016). Differences existed between the types of support that the participants sought, as well as how much they relied on the social support. These findings demonstrated that different individualised support may be required based on one's MT. This theme was formed of two sub-themes for the HMTG and four sub-themes for the LMTG.

HMTG. The HMTG appeared to have a strong social support network, as they did not report gaps in their support. Some of the participants *did require support* from sources such as slimming clubs and gym classes. Most participants had *little reliance on social support*, which is commensurate with mentally tough footballers who Cook et al. (2014) described as 'low maintenance' and only requiring support at critical times. Participant LMT14 discussed the presence of others had very little influence on his physical activity participation:

> In terms of the workout stuff, again I'm happy to do that sort of on my own or with other people. You know, I play badminton, squash with some people and then I'm going to start a spin class soon. But then again, I try and work out most days on my own anyway; go for a run or go to the gym or something. (LMT14)

Recent work (Crust, Swann, et al., 2014) also reported that mentally tough individuals can require elements of support, thus the present study identified the type of support that the mentally tough individuals could benefit from. When support was received a number of the HMTG relied on *informational support* to gain information, facts, and knowledge that they could implement, which is associated with enhanced weight loss (Rogerson et al., 2016):

> My family have never had the discussion [planning diet and physical activity] other than my sister, who is also a sportsperson. So you know, we might ask questions. But I guess primarily the contact or discussions for support would be with the physiologist or sports nutritionist working with our team. So that was the primary method of education as well (HMT11).

HMTG participants seeking knowledge and information is congruent with Kaiselar et al. (2009), who reported significant correlations between instrumental social support and MT, however gaining knowledge cannot be assumed to lead to the individual committing to behaviour change. The majority of the HMTG also expressed that informational support would be their preference if a support session were to be attended.

LMTG. A *gap in social support* was reported by all the LMTG, which caused most of the participants to *seek support* (e.g., from a personal trainer, or exercise buddy):

> And we wanted to go swimming…in actual fact she's from the befriender – I've had panic attacks going out…the Age Concern Befriending Service got involved and they introduced us to each other. She wanted to find someone

> who'd go swimming with her and I wanted someone. So when we were introduced we started going swimming. (LMT2)

A high number of the LMTG received *companionship support*, such as exercising with others, which was beneficial for fostering exercise adherence. Most of the LMTG also reported a preference for emotional based support from people who had been through a similar experience. The lower mentally tough individuals may naturally gravitate towards support to assist their behaviour change and weight loss. An over reliance on the support appeared to have potential detrimental effects when the companion was absent:

> A couple of weeks ago they [work colleagues] couldn't go [to a lunchtime gym class] and it was a week that I could go and I didn't because I didn't want to go by myself on the first time. But I think now I've been and I know where it is and who goes, I think…I'd be more inclined to make the effort to go. That said, it is easier when there's other people going. I think I definitely am more inclined to go if somebody else is going. (LMT6)

Despite receiving support, the majority of the LMTG held a *desire for further support*: "And in an ideal world I'd also have someone to cook food for me to make sure that I did eat the healthy things, so I just have something put in front of me, and then I'd have no problem eating it. It's the organisation that's the biggest problem." (LMT4). Thus, the LMTG appeared to rely on social support due to their lack of commitment and effort they were prepared to exert, which is congruent with Kaiselar et al. (2009) who reported MT and effort expenditure to be negatively related. Although it appears the LMTG require a strong presence of a social support network, in the long term it may be beneficial for the lower mentally tough individuals to

reduce the level of direct support, and gain a feeling of competence and autonomy which can aid weight loss (Gorin, Powers, Koestner, Wing & Raynor, 2014).

Motivation

Both groups discussed sources of motivation for adopting healthier lifestyle behaviours to achieve their weight loss goals. Differences existed between the HMTG and LMTG, which supports that tailoring support could assist individuals in their success at losing weight (i.e., high MT receive intrinsic motivation, low MT receive extrinsic motivation). There were two sub-themes for each group.

HMTG. Intrinsic sources such as *enjoyment* and *self-improvement* motivated the HMTG individuals to follow healthier lifestyle behaviours:

> I don't particularly like spinning, so that I don't really go anymore but I enjoy badminton, so I keep going to that and I had energised [a gym class] last night, although it killed me a little bit, I'd keep doing that. It's kind of like stuff that I do enjoy doing I will continue doing. (HMT10)

Mentally tough exercises are self-motivated, and require little support from others to provide motivation (Crust, Swann, et al., 2014). Therefore, it appears important that mentally tough individuals satisfy intrinsic motivation, such as enjoying the activity. This is in line with the cognitive evaluation theory (Deci, 1975), that completing a task for intrinsic factors can enhance motivation.

LMTG. A lot of the LMTG were motivated by extrinsic rewards such as *praise from others,* as well as *stickers and certificates* from weight loss support groups:

> You get little stickers…it sounds silly but they are actually quite motivating as well. And I've made a little, a physical version of that…I've got an

> ornamental bowl on my mantelpiece filled with this, a stone for every pound I've lost and little pretty gems that represent half-stone, and whole stone, markers (see Appendix Q). And that's quite motivating as well. (LMT1)

The ornamental bowl offered a visual representation of her rewards, which also provides extrinsic motivation (Appendix Q). Some of the LMTG appeared to have little intrinsic satisfaction, as demonstrated by some participants discussing their desire to lose weight without investing a lot of effort:

> It is that side that you go for [slimming club classes], with the hope that you're going to be Slimmer of the Week, but I haven't got the fighting spirit to actually push me to do it. It's like I watch that Biggest Loser and who's going to beat who with – I'd be the one at the back because I just haven't got the strength to fight, to push forward. I'd be happy to have it [winning title] and be the winner, but I haven't got the motivation to actually do what I should be doing if you know what I mean. (LMT2)

In the long term the relationship between MT and weight loss may become apparent if the extrinsic rewards and motivation remain the focus as opposed to intrinsic factors, as according to the cognitive evaluation theory providing external rewards can be detrimental to interest (Deci, 1975). Therefore, the LMTG may cease losing weight due to their sources of motivation. The individual has little control over the presence of external rewards; once the rewards are removed motivation can decrease, for example removal of external feedback (e.g. comments from others ceasing once weight loss has been achieved) is associated with weight regain (Reyes et al., 2011). Reduced positive comments could be expected during the weight maintenance stage due to less noticeable changes in the individual, thus alternative

forms of motivation will need to be drawn upon (e.g., intrinsic factors). This demonstrates that extrinsic rewards may be useful for low mentally tough individuals to change their behaviour (e.g., certificates stickers). Autonomous support is important during weight loss maintenance (Koestner, Otis, Powers, Pelletier & Gagnon, 2008), thus in the long term shifting their focus to more intrinsic factors (e.g., self-improvement at a sport, finding activities which the individual enjoys) could be important.

Coping Mechanisms

As discussed earlier (in the control theme) setbacks were experienced and control could be lost by both the HMTG and LMTG, however the LMTG did not rebound and regain focus as efficiently. Potentially, less effective coping mechanisms employed by most of the LMTG could be an important factor. A higher MT is associated with greater coping effectiveness and coping self-efficacy (Nicholls et al., 2011). When challenges and difficulties are encountered, a problem focused or problem avoidance approach can be adopted. Problem focused coping involves changing or eliminating the stressors (e.g., planning), problem avoidance refers to managing the emotional responses (e.g., deep breathing; Lazarus & Folkman, 1984); the latter of the two mechanisms is associated with better health outcomes (Penley & Tomaka, 2002) and weight loss maintenance (Reyes et al., 2011). In general, the HMTG appeared to adopt a more problem focused approach, compared to the LMTG who discussed frequent use of problem avoidance coping. These findings are in line with Nicholls et al. (2008), who reported a higher MT was associated with problem focused coping as opposed to those with a lower MT who employed more problem avoidance strategies. This theme was formed of two sub-themes for the HMTG, and two sub-themes for the LMTG.

HMTG. The HMTG displayed *problem focused coping* when challenges were encountered, or following a deviation from their plans:

> In hindsight I often think oh, I shouldn't have eaten that or I shouldn't have done this; or okay, I did this so – I sometimes try to think, so what triggered me into having something to eat that I didn't really want to eat but I felt I needed it in that point of time? (HMT12).

Through a process of self-reflection some of the HMTG could identify the root of the problem, which can inform future behaviour when the same triggers or scenarios are encountered. A process of self-reflecting and self-monitoring can facilitate weight loss (McKee et al., 2013) and is associated with high mentally tough individuals (Crust & Clough, 2011).

The HMTG also reported that periods when they were stressed or tired could have a negative impact on their lifestyle choices: "sometimes, if I'm feeling shit, I'll be like well fine I'll just have a pizza and some sweets…it's not the best coping mechanism in the world, obviously, but yeah I'd be lying if I said it didn't affect me." (HMT14). The reports of *emotional eating*, which may be unexpected due to the high emotional control associated with MT (Clough et al., 2002), appear congruent with some contemporary work. Caddick and Ryall (2012) proposed MT was not always associated with a 'macho image' of being a 'Hollywood hero', which has been built on a set of unrealistic criteria that one cannot achieve. The first-hand accounts capture a more realistic image, and that mentally tough individuals do not always match up to this 'superhuman' perception. Thus, this offers a more realistic account of MT as opposed to idealised and selective characteristics.

LMTG. *Problem avoidance coping* was commonly cited by the LMTG:

> I wanted to lose two dress sizes before my 40th birthday, which I didn't…I did manage to lose one dress size but then everything got in the way and I stopped doing the plan so on my 40th birthday, I was the same size as I had been at the start of the journey. As a result, I cancelled my 40th birthday party and didn't have one. Never mind (HMT3).

As being slim is important in the western culture, a sense of not fitting the ideal can cause low confidence (Grogan et al., 2017), furthermore, clothes being tight in places they are not desired to be tight can also influence confidence (Grogan, Gill, Brownbridge, Kilgariff & Whalley, 2013). In response to the negative emotions associated with low confidence, problem avoidance coping appeared to be employed by some LMTG individuals. For example, avoiding certain clothes when one is feeling more body-venerable may be one mechanism for women to protect themselves (Grogan et al., 2013). Thus, targeting the coping mechanisms of low mentally tough individuals may enhance weight loss, so the cause of the problem leading to an unhealthy lifestyle can be targeted (e.g., dietary consumption). For example, increasing problem solving ability which has been reported to result in significantly greater weight loss in obese women (Murawski et al., 2009).

Stress and challenges resulted in *emotional eating* amongst the majority of the LMTG: "if it's quite stressful at work, or if there's lots and lots going on, I tend to go for the comfort food" (LMT6). This finding is congruent with Stamp et al. (2014b) who reported MT was negatively related to emotional eating identity. The low levels of emotional control associated with a lower MT (Clough et al., 2002) may result in consuming fatty textured food to enhance mood and relieve stress (Gibson, 2006). Therefore, as well as enhancing coping mechanisms, increasing the

emotional control component of MT may be suitable to assist low mentally tough people to achieve their weight loss goals.

Perceptions of Weight Loss

There were differences between the LMTG and HMTG regarding their perceptions and approach to weight loss. The HMTG appeared to hold more positive perceptions regarding behaviour change to lose weight compared to the LMTG. Perceptions are important as an individual's perception can often drive behaviour change (Kiernan et al., 2012). Perceived barriers towards adopting and maintaining healthy lifestyle behaviours were also found to be more solvable in the HMTG, which is congruent with Stamp et al. (in press) who found weaker perceived barriers to exercise were significantly related to a higher MT. Furthermore, the HMTG appeared to have more realistic perceptions, compared to the LMTG who held a more 'all or nothing' view towards leading healthy behaviours. This theme was formed of three sub-themes for each group.

HMTG. Some of the HMTG participants held *positive perceptions* and viewed the process of losing weight as an opportunity for self-improvement, such as improving in their sport:

> I think last year I was marking a player, a player I would have looked up to and knew she'd been a very good player on the other team. And I remember kind of about ten minutes to go and she made a run away from me and she got away from me. And just in that split-second I thought…"I'm not fit enough for this," or I would have been fitter than the other twenty-eight players on the field, but she was the best player on the field and I wasn't fit

> enough for her. And that for me was a kind of trigger that I had to get fitter. (HMT11)

Appraising the situation (e.g., behaviour change) as a challenge and opportunity to develop is representative of a mentally tough individual (Clough et al., 2002). The HMTG held positive views towards barriers of leading a healthy lifestyle, and reported *solvable barriers:*

> I moved here about six months ago as well, so like adapting to kind of a new workout schedule here has been difficult. I think that's been something that's slowed my progress down somewhat but I think I'm kind of like working my way back into a routine now. (HMT14)

The HMTG did not always overcome their barriers immediately, however they persevered, which is a trait of high MT (Gucciardi et al., 2016). MT characteristics, such as the high levels of confidence in abilities to learn new skills and overcome challenges, have previously been reported to assist the mentally tough individuals in being less effected by barriers to healthy behaviours (Stamp et al., in press). Most of the HMTG viewed a barrier as decreasing the efficiency of their behaviour change, however it would not completely stall lifestyle behaviour change. This is commensurate with Crust, Swann, et al. (2014) who reported mentally tough exercisers find ways to overcome barriers.

The HMTG approached weight loss with *rational thinking*, being aware that it is normal to deviate from the plan and have a treat: "like if I want to have an ice cream, I'll have an ice cream. That would be my treat like" (HMT11). Holding realistic views about weight loss and expecting to deviate from healthy eating is a characteristic of successful weight loss (McKee et al., 2013). This in line with Crust

et al., (2016), who reported mentally tough mountaineers to think logically and be realistic, rather than responding to their emotions.

LMTG. The LMTG held *negative perceptions* and approached losing weight with a negative attitude: "I've never really succeeded in the past at doing it [losing weight] purposefully, so I think my mind just immediately has this perception thing, it's immediately negative, this is going to be hard work" (LMT5). The interference of past events upon present behaviour is in line with Dewhurst et al. (2012). Based on the directed forgetting paradigm, Dewhurst et al. (2012) reported that lower MT was associated with greater cognitive inhibitions that can result in the individual being unable to forget irrelevant information, which can inhibit subsequent behaviour. Delaney et al. (2015) recently provided an alternative explanation for the previous experiences and failure influencing subsequent performance amongst low mentally tough individuals. Low MT is associated with lower levels of conscientiousness; a personality trait associated with motivation and effort. Thus, suggesting the low mentally tough individuals may be less prepared to exert effort and remain motivated: "I haven't got the fighting spirit to actually push me to do it" (LMT2).

Perceived barriers were reported by all of the LMTG towards leading a healthy lifestyle, barriers included a lack of time, lack of finances, and changes in the environment (e.g., moving house). Participant LMT5 discussed the challenge of moving house: "There were dance classes on every corner in London, virtually, so I used to go dancing and things occasionally. Whereas here, I'd have to get on my bike and cycle quite a way to get to a dance class." Participant LMT5 did not display an attempt to circumnavigate barriers to participating in exercise, despite the fact the excuse appears to hold a feasible way to exercise - cycling. This is congruent with

models of behaviour change (e.g., HBM), which propose perceptions of the barriers of a behaviour influence the likelihood of the behaviour being performed.

The majority of the LMTG reported an 'all or nothing' perception towards whether they would lead a healthy behaviour, and appeared to present d*ichotomous thinking*: "I can't just have one biscuit…I either have none of them or all of them" (LMT6). Some participants discussed how they would go from one extreme to the other, for example some LMTG participants discussed either not eating or eating excessive amounts: "With that Juice Plus one [a juice based diet that does not involve solid food] where you couldn't eat anything…maintaining the normality after the diet, rather than going too far, was something that I can't quite get" (LMT7). Such cognitions can inhibit weight loss success (Rogerson et al., 2016). It maybe one's level of self-control which needs to be targeted to ensure that food can be consumed in moderation rather than an 'all or nothing approach'. Alternatively, it may be beneficial to reinforce that leading a healthy lifestyle and weight loss should be perceived as a long-term lifestyle change that is accompanied with deviations, and not a quick fix process (McKee et al., 2013).

Confidence

Confidence is a cornerstone of MT (Cook et al, 2014), and there was a clear difference in confidence levels between the two groups. In general, the HMTG were more confident than the LMTG, which is advantageous for the HMTG considering confidence is key determinant of behaviour change for weight loss (Dixon et al., 2008). Differences existed in confidence in abilities, as well as confidence growth between the LMTG and HMTG. This theme consisted of three sub-themes for the LMTG and one sub-theme for the HMTG.

HMTG. Most of the HMTG held *confidence in abilities* to change behaviour and achieve their weight loss goals as expressed by participant HMT16: "I thought I could do it and I'm very pleased that I have done it". Confidence has previously been associated with high MT individuals (Crust, Swann, et al., 2014). The confidence started high amongst this group, thus there were no reports of confidence growth.

LMTG. Most of the LMTG had low *confidence in abilities* to achieve weight loss: "I wouldn't say I was actually confident about it" (LMT2). Similarly, a lack of confidence in abilities was discussed by participant LMT4, who did not feel she had the knowledge or confidence to select the healthiest options:

> If I just had all the money in the world and all the time and I would have someone cook all my food for me. I wouldn't actually know what to buy if I was standing in the middle of the supermarket and I had all the options in the world. I wouldn't actually be confident to make the best decisions and pick the best brands off the shelf and read all the numbers on the back. (LMT4)

It appeared that most of the LMTG were not willing to commit and spend time enhancing their knowledge and confidence regarding the new behaviours, and they would rather pass the responsibility to someone else. Low levels of effort expenditure reported by low mentally tough individuals is congruent with previous work (Nicholls et al., 2008). A number of the LMTG also reported low levels of confidence that could result in social comparisons: "I don't like the gym…it is full of people who are fitter than me" (LMT3). *Upward social comparisons* to female bodies has been reported to be a key factor in drop-out of exercise, and were deflating to women with low body satisfaction (Pridgeon & Grogan, 2012). Therefore, enhancing the confidence component, or attending classes designed for

beginners, may enhance the likelihood of the lower mentally tough individuals adhering to healthy behaviours such as gym attendance.

Low levels of confidence due to body weight inhibited some of the LMTG aspects of their life, however through the process of losing weight and adopting a healthier lifestyle several of the LMTG participants experienced *confidence growth*, which created more opportunities to enhance the healthiness of their lifestyle:

> It [losing weight] has given me a better self-confidence again. I'm not confident in the area where I live, but to go away somewhere I'm more confident. You know, it's like…with confidence in going in the gym and things like that, I'd be confident to go on holiday, to go into the gym on holiday, whereas previously I wouldn't have even entered the gyms. I'd be frightened of all the fit people using the machines and laughing at me because I was so big. Whereas now I've got that confidence, I will actually go into a gym (LMT2).

Confidence growth was due to factors such as fitting into their environment, achieving a goal, losing weight, and external feedback from others. For example, participant LMT2 stated; "it's like when people say, 'oh you're looking good, you've lost a lot of weight,' I feel self-confident then". Thus, this group need additional confirmation to be aware that others perceive them differently. Weight loss within the first month of trying to achieve a weight loss goal can enhance confidence (Rohre, Vickers-Douglas & Stroebel, 2008), and increased confidence can benefit long term weight loss maintenance (Gupta, 2014). Thus, it is important to get lower mentally tough individuals to engage with losing weight from the beginning. Confidence may be a key characteristic of successful weight loss, which needs to be

targeted at an early stage during in attempts to intervene for low mentally tough individuals.

General Discussion

This study aimed to explore the experiences and perceptions of high and low mentally tough individuals pursuing a weight loss goal. In doing so, this fourth study sought to shed light on possible reasons why MT was not related to weight loss in Chapters Four and Five. As earlier discussed, the findings in Chapters Four and Five appear somewhat contradictory to the current MT definitions that state mentally tough individuals achieve their goals (e.g., Hardy et al., 2013; Bell 2013). By adopting a mixed-method approach the study aimed to select participants with a high or low MT, and understand their experiences of pursuing a weight loss goal to enable comparisons between the two groups. Including high *and* low MT individuals extends the majority of MT research, which sought to investigate characteristics and behaviours of mentally tough individuals, such as mentally tough footballers (Cook et al., 2014) or mentally tough exercisers (Crust et al., 2014). This deeper investigation into the earlier discussed relationships between MT and weight loss (Chapters Four and Five) has provided an insight into how the high and low mentally tough individuals can be both successful and unsuccessful at achieving their weight loss goals.

A unique characteristic of this study was the inclusion of the low mentally tough individuals who are an under-researched group compared to high mentally tough individuals. Gaining first-hand accounts from low MT individuals progresses work that based the characteristics on the opposite of data collected on mentally tough athletes (Gucciardi et al., 2008). Gucciardi et al. (2008) reported low MT individuals to be “lazy”, have “self-doubt”, and be “disorganised”, which presents a

set of undesirable characteristics. However, the current study reported low mentally tough individuals can achieve their goals and succeed at weight loss. One of the key factors that influence the LMTG weight loss was adopting strategies to overcome their low levels of control, as enhanced perceived control can facilitate weight loss (McKee et al., 2013). In addition, targeting the MT control component alongside the individual's pre-planned strategies to avoid loss of control could prepare low MT individuals for unfamiliar, and unexpected, events where they could be distracted from leading a healthy lifestyle.

A further contribution of the current study was that the mentally tough individuals were not 'superhuman' people who met a list of criteria based on the ideal mentally tough performer, which is an issue associated with previous MT work (Caddick and Ryall, 2012). The first-hand accounts collected in this study offered more realistic accounts compared earlier researchers (e.g., Jones et al., 2007). For example, it is not feasible for an individual to *always* be in control, and thus the theme *remain relatively in control* appears a more realistic description of the HMTG. The current study also demonstrated that high MT individuals can display some undesirable behaviours such as emotional eating. Furthermore, mentally tough individuals were identified to require support, which is in line with Crust, Swann, et al. (2014). It appears more achievable characteristics of mentally tough individuals transpired throughout this study.

It emerged that support may be differentiated based on MT. Although low mentally tough individuals have been reported to succeed, it is well understood that the low mentally tough individuals may find it harder to succeed due to possessing weaker psychological skills (e.g., Gucciardi et al. 2008). This is congruent with the current study that reported the LMTG required more support and interventions to

enhance personal characteristics (e.g., lower confidence, pessimistic views of weight loss), which indicates low mentally tough individuals require further investigation. Nevertheless, key differences, such as informational support and intrinsic motivation for the HMTG, and emotional support and extrinsic motivation for the LMTG, was evident. Therefore, support must be individualised as opposed to a 'one size fits all' approach (Hutchinson et al., 2014).

Reflexive Analysis

The research questions in this study emerged as a result of the findings in the previous three studies. The topic was a consequence of the researchers' personal interests to understand factors that can influence one leading a healthy lifestyle, and being a healthy weight. Thus, conducting the current research appeared an appropriate choice in exploring the researcher's personal interests, as well as offering recommendations to the SW service and individuals who are trying to lose weight independently. Furthermore, the research also progressed the current MT literature. The researcher was conscious that the interview process may be impacted by the way she was perceived. Her gender and healthy BMI classification could have been relevant when discussing dietary behaviours and physical activity patters with participants who ranged from having a normal to obese BMI. Furthermore, being a female researcher may have effected how the males responded during the interview. However, the researcher noticed the openness of all participants who discussed personal topics such as overeating, eating disorders, and depression. The researchers PhD supervisors were male, and their main role was to discuss the themes and comment on whether the themes appeared appropriate, it was beneficial to also gain a male perspective. The researcher deemed it useful to have these second perspectives, and it assisted in forming a clearer interpretation of the data.

Strengths, Limitations and Future Directions

Strengths. A strength of this study was the use of interviews with individuals who had a lower MT, which contrasts the majority of research which focused only on high mentally tough participants. Furthermore, the mixed-methods approach enabled quantitative and qualitative data to be combined in order to sample participants of particular interest (i.e., high and low MT). Specifically, using the MTQ48 to identify high and low MT individuals represents an improvement compared to much of the qualitative literature which has employed more subjective sampling criteria (e.g., Crust, Swann, et al., 2014; Jones et al., 2007). Additionally, including a qualitative phase in this study advances the numerous quantitative studies that may not capture the complexity of weight loss experiences (Reyes et al., 2012).

Limitations. Limitations were also present, as with any study. All participants were interviewed after the six months that their weight was tracked. Potentially, participants were recalling experiences from several months ago, which can lead to an unintentional inaccurate recall of their memories (Silverman, 2013). Participants also discussed an array of situations (e.g., effects of lifestyle behaviours from dealing with a divorce and caring for children, or not having a family to support), which can limit the extent of the comparisons between the LMTG and HMTG. The current study has captured the experiences of losing weight, however the underlying attitudes and beliefs that influence behaviour were not captured.

Future directions. Future work could focus on the LMTG, instigated due to their recognised difficulties and challenges being greater than the HMTG. Furthermore, researchers could conduct repeat interviews throughout the

participant's weight loss journey to gain an insight at various stages. Alternatively, researchers could adopt a different methodological approach that is less reliant on recall (e.g., vignettes or story completion; Braun & Clarke, 2013). For example, a vignette approach provides participants with hypothetical situations and explores how they expect the character in the scenario to respond. Thus, specific events would not be recalled as the method focuses more on the assumptions, beliefs, and perceptions of the participants, which could provide a further insight into this topic of interest (Braun & Clarke, 2013). Furthermore, a vignette approach may offer the opportunity for participants to discuss sensitive issues (i.e. weight), as they can be expressed through the character in the scenario (Braun & Clarke, 2013).

Applied Recommendations

The present work progressed understanding of MT by taking a more proactive approach, instead of just describing the characteristics, qualities, and behaviours of the high and low mentally tough individuals. Gaining an insight into the experiences and strategies individuals used during their pursuit of a weight loss goal offers suggestions for practitioners. This study presents a number of applied recommendations. The current study has highlighted potential characteristics of high and low mentally tough individuals during their pursuit of a weight loss goal. Practitioners can either ensure the range of support is available for all, or individuals can complete the MTQ48 as a screening questionnaire to enable tailored programmes to be provided. It appears that a key route to enhancing weight loss success amongst the high mentally tough individuals is to increase their awareness of the benefits of leading a healthy lifestyle and threats of an unhealthy lifestyle, and encourage them to make healthy behaviour choices (e.g., be physical activity, consume healthier food) a priority. This can be achieved via interventions based on

the HBM, for example informing the benefits of healthy behaviours and risks of obesity. The HMTG appear to have a relatively robust skill set to achieve their valued goals (e.g., high confidence, control over choices, positive perceptions).

The low mentally tough individuals appear a more complex group who can benefit from a number of different techniques. Enhancing their MT, particularly the confidence component, through interventions (see Crust & Clough, 2011) appeared important for weight loss success. Alternatively, teaching skills to circumnavigate barriers is an alternative route to overcome potential problems. For example, having healthy snacks readily available to avoid loss of control around unhealthy food options when hungry. Therefore, these differences highlight the requirement for individualised support and interventions (e.g., strong support network for low MT, informational support for high MT) as there is not a 'one size fits all' solution when offering weight loss support.

Conclusion

The fourth research objective of this thesis was addressed by this study through investigating the perceptions and experiences of high and low mentally tough individuals throughout their weight loss journey. The study also sought to gain an understanding into the reasons why MT was not associated with weight loss success. Importantly, this study has identified factors that are attributable to both the HMTG and LMTG success and failure at losing weight, offering an explanation as to why MT was not significantly related to weight loss in earlier work (Chapters Four and Five). Moreover, this study has supported previously cited characteristics of mentally tough individuals, it emerged that different attitudes amongst individuals with the same MT level can result in different weight loss outcomes. The differences between an individual's MT and weight loss achievements demonstrates the need for

individualised lifestyle behaviour plans, and not a 'one size fits all' approach. It appears that the role of MT within the HRLF domain differs from those areas previously researched (e.g., sport, business). For example, in the current study MT appears important for the process the individual experiences and not necessarily their success at weight loss, however earlier work reported MT to differentiate between successful and unsuccessful individuals (e.g., Marchant et al., 2009). Thus, this novel finding of MT and HRLF warrants further investigation. Furthermore, this study is amongst the first to demonstrate success amongst low mentally tough individuals.

The data demonstrated differences between the two groups. The LMTG appear to be extrinsically motivated, have lower levels of confidence, require greater levels of support, and have the potential to adopt appropriate strategies to enhance weight loss. Additionally, the LMTG have lower levels of control, which with appropriate strategies could be circumnavigated. The HMTG referred to having greater levels of confidence and optimism, displayed lower reliance on support from others, and were more intrinsically motivated. The HMTG appeared in control of their choices which presented both healthy and unhealthy outcomes dependent on the priority of their goals.

Chapter Seven - Study Five: A Mixed-Methods Investigation of the Perceptions, Beliefs, and Attitudes of Low Mentally Tough Individuals Pursuit of a Weight Loss Goal

Introduction

The preceding studies in this thesis have illustrated the complexity of the relationship between MT and weight loss, which appears much more intricate than first (and theoretically) expected. A strength of the previous study was the mixed-method approach employed that first quantitatively sampled high and low mentally tough individuals, and was proceeded by in-depth semi-structured interviews. Low MT participants were identified as a population who require assistance to either circumnavigate their low levels of MT, or enhance their MT, during their pursuit of a weight loss goal. Furthermore, the low MT individuals are an under researched group in contrast to mentally tough individuals. To enhance understanding of this complex relationship, and gain a deeper understanding of the low mentally tough individuals, a further mixed-method study could be conducted with an alternative qualitative phase to tap into other aspects of lifestyle behaviours and weight loss (e.g., perceptions and beliefs of the lifestyle behaviours adopted, rather than experiences of different lifestyle behaviours). The vignette approach can explore the attitudes, beliefs, and perceptions of the individual (Braun & Clarke, 2013). Therefore, the final study in the thesis addressed the fifth research objective (i.e., investigate low mentally tough individuals' attitudes, beliefs, and perceptions, during the pursuit of a weight loss goal).

Predominant models of behaviour change focus on an individual's beliefs (e.g., HBM), attitudes (e.g., TPB), and perceptions (e.g., HAPA; Schwarzer. 2008) of a given behaviour or environment. Therefore, understanding one's beliefs, attitudes, and perceptions, in determining lifestyle choices appears a pivotal aspect in gaining knowledge on modifying lifestyle behaviour choices to achieve weight loss.

Adopting a vignette approach may be an appropriate method to gain these additional aspects (Braun & Clarke, 2013).

The previous chapter identified that targeting the high mentally tough individuals' belief of the threats and benefits towards a healthier lifestyle, and increasing goal importance of weight loss, could enhance their likelihood of behaviour change. The mentally tough individuals appeared to require less assistance, for example the majority reported high confidence levels and more positive perceptions of weight loss, which is associated with successful weight loss (Rogerson et al., 2016). The low mentally tough individuals' attitudes, beliefs, and perceptions are less understood, and these participants were identified as requiring help and assistance deeper than changing the perceived importance of leading a healthy lifestyle and losing weight. Therefore, research that further explores the low MT participants can enable the key factors of their weight loss journey to be identified, which will enhance understanding of MT and HRLF and weight loss, and provide a strong end point of the empirical studies in this thesis.

Vignette Approach

As discussed in Chapter Two (Methods to Investigate Health-Related Lifestyle Factors and Weight Loss, p. 50), a vignette involves a hypothetical situation with fictional characters being presented. The situation can be based on data obtained from participants' actual accounts (e.g., data collected in semi-structured interviews; Allen-Collinson et al., 2016). The open-ended nature of the scenarios would enable the assumptions and beliefs of the low mentally tough individuals to be captured, by discussing the fictional character as opposed to direct questioning of the participant's beliefs, however sufficient information and context is provided for the participant to enable an understanding of the scenario being

depicted (Braun & Clarke, 2013). Obtaining prospective data could enable the participants' immediate responses to the given situation to be captured, and reduce reliance on retrospective recall of personal events. A more prospective approach would build upon the semi-structured interviews that explored the lived experiences of participants in Study Four.

Discussing a mutual event has permitted direct comparisons between participants, for example within the MT literature Swann, Crust and Allen-Collinson (2016) explored the role of MT in an event shared by all participants; the 2015 Mount Everest disaster. To enable more direct comparisons to be drawn within this thesis, discussing uniform events in which all participants are referring to the same event or situation can allow direct judgements to be made and result in clearer conclusions. For example, in Study Four all participants were questioned about challenges they had experienced, however the context of each challenge differed between participants (e.g., relocating cities, overcoming a life-threatening illness). Therefore, a vignette approach will overcome this and enable uniform events to be investigated.

Researchers have demonstrated that vignettes appear appropriate for exploring health related issues (e.g., Allen-Collinson et al., 2016; Jackson, Harrison, Swinburn & Lawrence, 2015). For example, vignettes have been used to investigate the lived experiences of having asthma (Allen-Collinson et al., 2016), and explore attitudes toward complex public health matters (Jackson et al., 2015). Discussing situations through a hypothetical character can enable sensitive data to be collected via an indirect, non-confrontational manner (Jenkins, Bloor, Fischer, Berney & Neale, 2010). Discussing a character as opposed to the individual them self can appear less threatening (Braun & Clarke, 2013), and therefore enable the participant

to feel more comfortable and potentially respond more openly to allow better quality data to be collected.

Study Aims

The final study of this thesis aimed to gain a deeper understanding of the role of MT in the pursuit of a weight loss goal, by further investigating low mentally tough individuals' attitudes, beliefs, and perceptions, regarding HRLF and weight loss. Employing a mixed-methods approach enabled the low mentally tough individuals' perceptions and attitudes towards weight loss to be further explored by investigating information rich cases. This final study will contribute to addressing research objective five.

Method[6]

Research Design

Analogous to Study Four, Study Five adopted an explanatory sequential participant-selection design (quant → QUAL; Creswell & Plano Clark, 2011). The initial quantitative assessment of MT (via MTQ48) in phase one enabled purposive selection of low MT participants, by identifying individuals with low MT. The second phase, which was the primary focus of this chapter, consisted of vignettes in which the hypothetical situation explored a character who was trying to lose weight. The vignette was presented in the form of an interview. It is this secondary phase that the current chapter will focus on, only brief reference will be made to the relevant quantitative phase (discussed in full detail in Chapters Four and Five), which was used for participant sampling.

[6] The methods discussed in this chapter are focused on the qualitative aspect of this study, with a brief overview of the relevant quantitative method that was used for participant sampling. The quantitative phase of this study is discussed in full detail in Chapters Four and Five.

Vignette approach. Varying methods can be used to present a vignette (e.g., surveys, videos), the current study utilised a semi-structured interview (Sparkes & Smith, 2014). Vignettes can be used as complimentary to other methods (Hughes, 1998), for example Allen-Collinson et al. (2016) conducted semi-structured interviews to inform the scenarios utilised in their subsequent vignettes. Therefore, the vignette design in this study will be informed by the semi-structured interviews in Study Four. Areas which transpired as being important and requiring a deeper understanding were incorporated into the vignette (e.g., social support, perception of a situation). An outline of each vignette is provided below, or the full vignette is presented in Appendix S.

Participants

Commensurate with Study Four, intensity sampling was used to purposively select information-rich cases (Patton, 2015; see below for description of sampling technique). The sample included six females and one male, aged between 23 and 64 years old (M = 38.57 ± 5.59 years) from either Studies Two (n = 2) or Three (n = 5). Three of the participants were involved in Study Four, and an additional four participants were recruited from the earlier studies in this thesis (e.g., Studies Two and Three). Selecting participants from previous studies enabled the sampling to be based on MT. Furthermore, their weight loss progress and MT could be obtained, which enables the qualitative data to be matched to the quantitative results.

The Interviewer

At the time of the first interviews, the interviewer was a 24-year-old female PhD student. The researcher had not previously attended a weight loss club, but was conscious about being physically active and consuming a healthy diet to maintain a healthy weight.

Table 7.1

Description of the Participants

Participant number	Age	BMI (kg/m²)	Gender	MT score (sten)	Study	Last recorded weigh in (week)	Weight change at last weigh in (%)
1	64	35.68	Female	1.91 (1)	Two	3	+3.86
2	41	35.71	Female	2.11 (1)	Two	16	+6.76
3	38	23.72	Female	2.83 (2)	Three	24	+2.08
4	23	26.45	Male	2.60 (2)	Three	24	-1.72
5	21	25.22	Female	2.87 (2)	Three	24	+10.92
6	23	23.00	Female	3.04 (3)	Three	24	-3.34
7	60	32.7	Female	3.12 (3)	three	24	-1.44

Procedure

Ethical approval was granted from the relevant university ethics committee. The main considerations were maintaining confidentially, as well as the participant being aware that the interview could be terminated at any time. Right to withdraw from the interview was important as sensitive topics were discussed. All participant information sheets and transcripts were stored in a locked cabinet inside of a secure office. Following the interview participants were provided with a debrief to outline the nature of the study and provide contact detail of the lead researcher. Like Study Four, the quantitative phase consisted of assessing MT by completing the MTQ48, and monitoring weight over a six-month period. This phase was used to purposively select participants who had a low MT, which was assessed by their MT sten[7] (the

[7] Note: MT score of ten (sten) indicates the participants approximate position of their MT in relation to the MT of the general population. The scores range from 1 (lowest MT scores) – 10 (highest MT scores) with a mid-point score of 5.5. sten 1-3 = low MT, STEN 3-7 = mid MT, sten 7.1 – 10 = high MT. A set range of MT scores is represented by a set sten score (e.g., MT score 1 – 2.71 is represented by sten 1).

procedure for this is discussed in the previous chapter). Participants who had participated in Study Four, and additional participants who were grouped as low MT were contacted via e-mail to invite their participation. Data were collected until data saturation was deemed to have been reached (Cote, Samela, Baria & Russell, 1993). A reduced number of emerging themes appeared after the sixth interview, after which one final interview was conducted. As with the previous study, rapport was established prior to the interview and participants selected their preferred method of communication; four face-to-face, one telephone, and two electronic interviews (i.e., via Skype) were conducted. Interviews lasted an average of 41 ± 10.48 mins, and were digitally recorded and transcribed verbatim.

The Vignette-Focused Research

The steps proposed by Jackson et al., (2015) were used to guide the development of the vignette. The scenarios revolved around a fictional character starting a weight loss journey, and progressed to being a couple of years into the weight loss journey. The scenarios presented challenges and difficulties that the character encountered. The hypothetical situations were based on the findings from the semi-structured interviews in Study Four, as suggested and implemented by previous researchers (e.g., Allen-Collinson et al., 2016). Scenarios were based on real, mundane occurrences to offer realistic situations (Barton & Renold, 1999). The character, Sam, was given a gender-neutral name so the participant could interpret it as either male or female.

The researcher presented a 'developmental story' (see Appendix S) that unfolded through a series of stages, at the end of each stage opened ended questions

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Sten scores were discussed in more detail in the Methods to Investigate Mental Toughness (p. 35)

regarding the character were asked to guide the responses in relation to the specific purpose of the research (Sparkes & Smith, 2014). Questions cohered around the perceptions and attitudes of the character, as well as the participant's belief of how Sam would act as opposed to how the individual themselves would react, can reduce social desirability (Constant, Kiesler & Sproull, 1994). The 'developmental story', as well as probes, were used to elicit a deeper understanding and insight into the participants' experiences (Sparkes & Smith, 2014). Three stages were presented, which has been identified as an appropriate number as an excess of three changes to a story line can lead to confusion (Finch, 1989). The scenarios explored social support, control over behaviours, reactions to unexpected events, and development of MT and psychological skills. If at any point the participant appeared uncomfortable or unwilling to discuss a topic, the researcher offered to terminate the interview.

The first vignette captured the participants' beliefs and attitudes towards social support. The expected initial perceptions that Sam would experience when pursuing a weight loss goal, and preferred types of support, were explored (e.g., informational support, or emotional support). The second vignette progressed to a couple of years later, to explore the participants' beliefs of pursuing a weight loss goal after a period of time. The scenario aimed to investigate how an unexpected event (i.e., a lunch time buffet at a work meeting) is perceived and affects an individual when plans of healthy behaviours (i.e., planned lunchtime gym workout with a friend and a healthy packed lunch) can face disruption, and provide temptation. The questions on this scenario centred on whether the buffet would be eaten instead of the intended pack up, how Sam would feel towards this situation, and whether Sam's friend would still attend the gym session. The final vignette

involved Sam having to stay late at work following a tiring and stressful day. Participants discussed whether Sam would cook a healthy meal or eat a takeaway, the effects of emotions such as stress and tiredness on one's behaviour, and the influence of social factors on behaviour choice. Furthermore, the perceptions of selecting the unhealthy and healthy choice were discussed, as well as the effect of the prolong period of time that Sam had been pursuing the weight loss goal had on his/her response to the situation.

Data Analysis

The researcher became immersed in the data through a process of "in-dwelling" which involved repeat readings of the transcripts (Maykut & Morehouse, 1994). The inductive analysis allowed the emergence of new themes from the data (Sparkes & Smith, 2014). Braun and Clarke (2006) six steps outlined in Study Four (p. 163) guided the analysis. Initially, codes within the data were identified, similar codes were ordered and combined into sub-themes. The same process was employed to sort sub-themes into themes, which reflected the perceptions, attitudes, and beliefs, of low mentally tough individuals during the pursuit of a weight loss goal.

Establishing Trustworthiness

Processes to contribute towards establishing trustworthiness were similar to the steps undertaken in the previous chapter. This study aimed to enhance credibility through a process of peer debriefing and gaining feedback from "critical friends". Peer debriefing was conducted throughout the study during regular formal meetings between the research team, as well as informal discussions on a one to one basis. The supervisory team provided guidance on the research process, reviewed data, and challenged assumptions (e.g., questioning interpretations of results; Creswell & Miller, 2000). Furthermore, "critical friends" (e.g., supervisors, peers) offered

feedback and critiqued the results of these processes (Smith & Caddick, 2012). A summary report was also sent back to participants, as a form of member checking, to check the researcher's interpretation with the participants (Appendix U). Reports were received positively, and no changes were suggested.

Follow up interviews were conducted with two of the participants who were involved in this study and in Study Four (LMT2, LMT3). The selection of the two participants was based on their expression of interest to be followed up during the fourth study, as well as noticed changes in their perceptions toward weight loss during the current study, which could offer a further insight into the pursuit of a weight loss goal in low mentally tough individuals. These interviews were unstructured and focused on exploring the individuals' changes in perceptions and attitudes towards pursuing a weight loss goal since the beginning of their weight loss journey (Sparkes & Smith, 2009). Furthermore, this process enabled exploration into the similarity between the participant's own perceptions and behaviours, and how they would expect the character to perceive a situation and behave, which assisted in establishing trustworthiness. The follow up interviews were conducted face-to-face (n = 1) and by telephone (n = 1), and lasted an average of 15 ± 2.31 minutes. The findings of these follow up interviews confirmed similarities between the participants reported experiences and their responses to the vignettes. The follow up interviews also provided unique insights into changes in the individual's perceptions and attitudes over time, and were therefore considered important to include in the data analysis *in addition to the vignettes.*

Results and Discussion

The themes that emerged from the inductive analysis are presented in this section, with verbatim quotes to give voice to the participants. In line with aims of this study an overview of the beliefs, attitudes, and perceptions, of the low mentally tough individuals are presented. Four themes emerged from the data: perception of healthy behaviour; value of social support; confidence; and miscellaneous. These themes are discussed in terms of sub-themes (*italicised text*), and direct quotes from the raw data. Prior to a discussion of the themes, a section discussing the relationship the participants held with the hypothetical character is presented. The hypothetical character Sam is discussed throughout the chapter, and is referred to as he/she depending on the participant's interpretation. This section offers the results and discussion combined, to enable discussion of the results as they are presented in relation to existing literature, which can provide tentative explanations for the relationships reported in Chapters Four and Five and build on the results in Chapter Six. Participants are represented as a number to retain anonymity (P1 – P7).

There were a number of similarities between the findings in the current study and those in the previous chapter for the LMTG, for example, the low levels of confidence, reliance on social support from a range of sources, and anxiety towards certain environments (e.g., the gym). The congruence between the discussed experiences in the previous chapter suggest the vignette prompted individuals to draw upon past experiences and their own underlying assumptions, attitudes, and beliefs. This Chapter aimed to extend the understanding of MT, and HRLF and weight loss that have been reached so far in this thesis, hence the congruent findings are not repeated in this section; only the novel aspects that the data in this study adds to the current knowledge are discussed.

Table 7.2

Themes of Low Mentally Tough Individuals Pursuit of a Weight Loss Goal

Raw data	Sub-theme	Theme
He might have struggled on home and still made the healthy meal (P3)	Negative perceptions of effort	Perception of healthy behaviour
She will probably think it is impossible at the start…but there is an end to it (P6)	Initial negative perceptions	
Community kind of feel (P3)	Reduce isolation	Value of social support
Peer support, I believe very strongly in. (P1)	Reciprocal relationship	
Sometimes it's easier just to make an excuse (P4)	Circumnavigate low levels of confidence	Confidence
Just want to fit in a little bit (P3)	Low interpersonal confidence	
Early on in that diet, you have not learned all the coping mechanisms and all the little tricks (P2)	Changes in coping ability	Miscellaneous
It [the injury] would resolve, but until it did, bed rest…it's amazing how much weight you can lose when you can't get to the kitchen to feed yourself. (P2)	External Locus of control	

Relationship with the Hypothetical Character

Throughout the interviews numerous participants appeared to perceive Sam as being their own gender, which is important for assisting the individual to relate to the character in the situation (Jenkins et al., 2010). Participants provided their own experiences to support their choices (e.g., "Going off my own self, if it were me…" [P1]; "Talking personally..." [P3]; "I've been in that situation…" [P3]). The frequent incorporation of personal experiences into the responses demonstrates the participant drew parallels between Sam and their self. Incorporations of personal experiences meant that the participant swapped between talking in the first and third person,

which is apparent in the direct quotes, and thus are a combination of third and first person. Quotes from the follow up interviews are also presented in the first person, which are signalled with a footnote.

Perception of Healthy Behaviours

The perception of healthy behaviours theme captured how the participants perceived Sam to act, as well as the participants' views on the behaviours that Sam would display. This theme was comprised of two sub-themes. Perceptions are an important aspect of some behaviour change models, for example the HBM considers one's perceptions of the benefits and threats of behaviour change influences their actual behaviour. During the third vignette participants discussed whether Sam would eat a planned healthy meal, or eat a takeaway following a stressful day at work with a late finish. All participants selected the takeaway option as they felt Sam needed to be "perked up" (P5), and deserved a treat after a stressful day. When discussing the healthy option, most of the participants held a *negative perception of effort* that cooking the healthy meal involved: "It would be really hard for her to go home and cook a like a healthy meal…I could probably see her going to get a takeaway" (P6). However, following consumption of the healthy meal all participants agreed that Sam would have positive feelings: "Sam, I'm guessing wouldn't have been bothered to cook and eat the healthy meal…but would have felt much better afterwards [eating the healthy meal] for sticking to the plan" (P5).

In terms of exercise, when discussing if Sam's friend would attend a gym workout that Sam could not attend, participant P7 expressed her perceptions that going to the gym alone would be an unenjoyable and undesirable experience: "Neither of them really want to go [to the gym]." As perceptions can often drive behaviour change (Kiernan et al., 2012), targeting one's perceptions appears

important to make the behaviour appear achievable and something one would want to do. For example, perceiving the healthy option as a high amount of effort has been reported to deter the individual; exertion has previously been found to inhibit one's participation in health-related lifestyle behaviours such as exercise (Stamp et al., in press). Therefore, reducing perceived physical exertion would be expected to result in higher levels of exercise participation.

Participants also discussed how Sam may have held *initial negative perceptions* when approaching the challenge of weight loss: "At first she would see it as difficult and hard…in the end she would see it was good for her" (P5). Acknowledgement that Sam's perceptions may change during the weight loss journey appears promising, as it may be possible to modify perceptions of the low mentally tough individuals when approaching weight loss. For example, perceived barriers (e.g., not enough time to cook; Farahmand et al., 2012), may be overcome through suitable interventions, and reduced once results of lifestyle change are apparent (e.g., weight loss).

Value of Social Support

The theme value of social support referred to the benefits Sam would be expected to receive from gaining support off others, which can inform practitioners of the important components and outcomes of social support. This theme was comprised of two sub-themes. Chapter Six reported that the low mentally tough individuals held a high reliance on social support. The current study extended this and investigated the underlying attitudes and values of social support, to identify why it was sought. The first vignette discussed the form of support Sam would be expected to select (either factual based support from experts, or anecdotal based

support from people who have been through a similar experience), all participants discussed the benefits of the latter:

> I think it's [information support option] more likely to be a difficult thing, I think if you are an emotional eater it's very easy to think that you have failed very quickly. So if she comes across a situation in a very formal weight loss group where she doesn't succeed one week or one day, it would be detrimental, rather than in a group of emotional support where people would say, that's okay, it happens get back on it. (P2)

In line with the theory of self-efficacy (Bandura, 1989), particularly vicarious experiences, others talking about how they lost weight may enhance self-efficacy for weight loss in the low mentally tough individuals. It transpired the reliance on social support was to *reduce feelings of isolation,* for example by creating a "community kind of feel" (LMT1). The social support provided belonging and a sense of unity, which can offer companionship (Wills et al., 1991). Therefore, it is not solely providing support for the individuals, but how the support is offered is important too. Ensuring support is based on a strong network that one can belong to may create an effective social support network for low MT individuals.

Most of the participants discussed providing support to others; a *reciprocal relationship* emerged, whereby participants discussed the importance of offering as well as receiving support. For example, participants' beliefs regarding support were explored: "In the group scenario, talking to someone who has been through it, they might be ahead of Sam. Might say nothing worked for me [to lose weight] until I tried this option that worked. Peer support, I believe very strongly in" (P1).

Participant P3 discussed that Sam may offer social support, and explained the importance of providing social support to increase self-worth:

> You've got some worth then, haven't you? You've got some value within the system. It's not just you going, "Help me, help me." It's you going, 'I'm helped, so if I can help you,' and I think it has to be sort of more integrated I think, which is what is nice about Slimming World groups and things, is you do get that sharing of information.

In line with previous work, which reported mentally tough individuals to have a selfish streak (Cook et al., 2014; Crust, Swann, et al., 2014), here the low mentally tough participants refer to the contrary and discuss offering time and help to others. This demonstrates the importance of offering support, to make the individual feel valued. Potentially, providing people within a peer support group a specific role may assist the less mentally tough individuals in adopting healthier behaviours and thus lose weight.

Confidence

This theme captured the extent that confidence could influence the likelihood of participants selecting healthy behaviours. The theme consisted of two sub-themes. During the second vignette, participants discussed whether Sam would eat an unexpected buffet at a lunchtime meeting, or if the healthy packed lunch as initially intended would be consumed. There appeared to be a split decision between the participants as to whether Sam would select the buffet or the packed lunch, which is counterintuitive to the expectations of low MT individuals who are distractible and unfocused (Gucciardi et al., 2008) implying they may eat the buffet. Whilst discussing the different options some of the participants referred to *low interpersonal*

confidence: "If everyone is doing it [eating unhealthy food] around her in her social environment…she will just be tryna fit in with everyone else and things" (P6). Some participants expressed their desire to "fit in" (P3) and acknowledged that the decision as to whether Sam would be comfortable being different to his/her colleagues "depends on how confident Sam is" (P3).

> I think in some situations, especially in a working environment, people can be quite strange, if you don't eat a free buffet and you can get a lot of negativity on, too good to eat what we are eating or go on just have one cake. So if you kind of say, "oh I have already eaten...I am just having this little bit", then it's a way of cancelling the situation out, saying "yeah it looks lovely but I have already eaten. I forgot we were having this, so, I was hungry early so I just ate my sandwiches", you can avoid the mine field of potential judgement. (P2)

Low interpersonal confidence was reported as a potential hindrance for low mentally tough students' progression at university, as they may not have the confidence to seek help when required (Crust, Earle, et al., 2014). In the current study, it appeared the low mentally tough individuals did not have the confidence to be different to others. As demonstrated by P2 above, the low interpersonal confidence led to excuses being suggested by a number of participants to account for why Sam was different to others, in order to *circumnavigate low levels of confidence*. Enhancing one's confidence in their decisions can assist in selecting the healthier option, and continue with the healthier behaviour. For example, holding optimistic views about food consumption, such as the belief that Sam's diet is healthier than those around (e.g., eating the healthy packed lunch not the buffet is a

positive choice), is positively correlated to a healthier eating behaviour (Sproesser et al., 2015).

Previous work discussed the importance of self-control and resisting temptation of food to facilitate weight loss (e.g., McKee et al., 2013). This finding extends the work in the previous chapter, which reported the low mentally tough individuals' low levels of control resulted in deviations from their intended plan; remaining in control can assist one to lead a healthy lifestyle (e.g., being in control around potential distractions in the supermarket). The present study highlighted the importance of confidence for one to remain focused on leading a healthy lifestyle. It emerged that low mentally tough individuals hold concerns regarding how they are perceived by others and if they 'fit in'. Therefore, enhancing confidence may be important in reducing barriers to healthy lifestyle behaviours.

Miscellaneous

The theme miscellaneous captured data that did not appear to fit into a theme, which is an acceptable method to house sub-themes that do not fit into themes (Braun and Clarke, 2006). These data were deemed as important findings and thus needed to be retained in the analysis. This theme consisted of two sub-themes.

The developmental story in the vignette (Sparkes & Smith, 2014) enabled participants' expectations that Sam would experience *changes in coping ability* to be captured. The participants could relate to progressing through their weight loss goal pursuit, as all participants had been trying to lose weight over a long period of time (at least 1-2 years). Sam started a weight loss journey with a support programme for the first 12 weeks (vignette 1), and had progressed to two years into the weight loss journey (vignette 3). Most of the participants expected Sam would learn coping

strategies to assist weight loss: "if she has been focussed on it [losing weight] for a couple of years…she should have some coping strategies" (LMT2). The incremental attitude regarding the malleably of their skills could be applied to expectations that MT components (e.g., confidence and control) can be enhanced, which contributes to researchers who have investigated MT development (Crust & Clough, 2011).

During the third vignette participants discussed how Sam would feel while consuming the takeaway. Some participants reported an *external locus of control* can monitor food intake, and P3 referred to her personal experiences:

> I'll have to savour it [unhealthy food] now because the braces won't allow me to guzzle it, so I take my time and I really appreciate the fact that I'm eating it. That's quite a big change for me, is that I'm really mindful when I'm eating it.

Whereas in previous work an external locus of control is frequently perceived as a barrier to leading a healthy lifestyle, and one requires a high level of self-control to facilitate weight loss (McKee et al., 2013), it emerged that an external locus of control can have a positive effect for low mentally tough individuals. Participants drew upon personal experiences to demonstrate an external locus of control, such as having braces (P3), or being bed-bound for medical reasons (P2). For example, participant P3 discussed how "outside forces" that "police" her behaviour facilitated in reducing the number of snacks consumed. During the follow up interview, participant P3 reported her perceived control was attributable to the unstable and external force of getting braces:

> And then I got my braces and they made a dramatic difference, because you have to brush your teeth every time you eat. So you can't snack…you can but

> that would mean there would be food and stuff stuck in your braces…So I have disciplined myself…to have my breakfast brush your teeth, don't eat again 'till lunch. Have my lunch brush my teeth, don't eat again 'till tea…it's disciplined me not to keep grazing all the time.[8] (P3)

Congruent with the TPB the external forces may have increased the individual's perceived control, which can enhance their intentions and increase the likelihood of a behaviour being performed. External agents imposing control over one's lifestyle choices due to the threat of a punishment stands in contrast to Hardy et al. (2013), who reported that lower mentally tough individuals have a higher reward sensitivity (e.g., consuming hedonic foods – foods eaten for pleasure) and lower punishment sensitivity (e.g., brushing teeth). Therefore, consuming the snacks would be expected to continue due to the pleasure associated with some foods, with little consideration for the punishment of having to brush her teeth. This demonstrates that a punishment environment, which has previously been used to enhance high mentally tough cricketers' MT and cricket skills (Bell et al., 2013), may assist the low mentally tough individuals in leading a healthy lifestyle. An external locus of control was portrayed negatively in the previous chapter; however, this work has highlighted the benefit of being controlled by external forces if delivered in the correct way.

Identifying the effect of removing the external forces would be required, as at present the participants discussed relatively extreme responses such as not snacking, or not being able to move out of bed. If overeating returned once the external forces were removed, it signifies that it may be more a case of dichotomous thinking; a

[8] Quote taken from the follow up interview, thus expressed in first person

characteristic of the low mentally tough individuals in Chapter Six. If this is the case problems will arise when the external forces are removed, as the individual can return to their old eating habits, or compensate for a lack of food and eat an excessive amount.

The external forces appear beneficial initially, however problems could arise in the future as a lack of an autonomous environment can be detrimental to weight loss maintenance (Cobb-Clarke, 2014). Potentially, the lower MT participants may benefit from such punishment environments alongside interventions to enhance their control component (e.g., attribution training; Clough & Strycharczyk, 2012), which may encourage the individual to exert responsibility over their choices. The individual may ultimately feel responsible for the healthy behaviours, as opposed to the external forces, and continue to lead a healthier lifestyle.

Additional Findings

The follow up interviews with participants (P2, P3) also provided insightful findings, which add further support to the discussed data. Comparisons were made between the responses of the participants in the current study who also participated in the previous mixed-methods study presented in Chapter Six (participants LMT3 and LMT5 in Chapter Six). The interviews were conducted over a year apart, thus changes in the perceptions and attitudes of pursing a weight loss goal were observed. For example, in Study Four participant LMT2 stated: "I'm always very envious of those wonderful people that can walk in and go, I've lost six pounds today. I think "I want to smash your face in". Her perceptions then altered: "Everybody's journey is different…you have to not judge yourself by someone else's achievements"[9]. The

[9] Quote taken from the follow up interview, thus expressed in first person

shift from a more ego orientation to task orientation is more likely to result in self-improvements and thus weight loss. Furthermore, she discussed having low levels of control in the previous study: "I think it's very easy…once you've fell off the wagon for a day, it's very hard to get back on it, so to speak." , and her control had increased in the current study: "I can kinda like just go no that days gone [eating the wrong food], today's a new day" [10]. These changes in perceptions and attitudes of low mentally tough individuals demonstrates that with an appropriate environment and support their perceptions altered towards weight loss (McKee et al., 2013). Changes in perceptions could be a result of enhanced MT, or teaching the skills that a mentally tough individual would adopt.

The attitude toward weight loss had also changed, P3 frequently referred to medical tests and illnesses that may be inhibiting her weight loss in Study Four. At the follow up interview, she discussed that her medical tests had come back clear, and she has started losing weight due to external forces (i.e., her braces): "So I got the medical results back for coeliac and things…they all came back clear…the thing that has really helped me lose weight, I think, is these braces" (P3). This demonstrates the importance of altering perceptions of weight loss and observing it is possible (i.e., when food was restricted due to the braces weight was lost), as well as the benefit of an external locus of control.

General Discussion

This study aimed to explore the beliefs, attitudes, and perceptions of low mentally tough individuals in the pursuit of a weight loss goal. In doing so, this final study in the thesis sought to enhance the understanding on the relationships reported

[10] Quote taken from the follow up interview, thus expressed in first person

between MT and weight loss in Chapters Four and Five. Specifically, the study investigated low MT individuals, due to being an under researched population that appeared to require more assistance than the high mentally tough individuals. By adopting a mixed-method approach, low mentally tough individuals were sampled, and participated in the vignettes.

This vignette approach offers a unique contribution to the current MT body of literature. Investigating the attitudes, perceptions, and beliefs, of the low MT individuals through discussing hypothetical situations extended the understanding of their pursuit of a goal. Examining such factors (e.g., beliefs, attitudes) is particularly important for investigating behaviour change, considering their incorporation in a number of behaviour change models (e.g., belief is a component of the HBM).

The key extensions of the findings in the previous chapter that the current study has provided included the identification of the underlying reasons for social support, which can inform how to deliver support to low MT individuals. For example, ensuring there is a community feel that promotes one's self-worth within the group. Additionally, participants discussed deviating from their plans due to a low level of confidence in being different to others, which extended study four that focused on low levels of control causing a deviation to plans. The current work also identified ways that an external locus of control can enhance behaviour change and weight loss progress in low mentally tough individuals.

Reflexive Analysis

The findings of the previous four studies influenced the research questions in this study. The topic was a consequence of the researchers' personal interests to understand factors that can influence one leading a healthy lifestyle, and being a healthy weight. Thus, as in Study Four, conducting the current research appeared an

appropriate choice in exploring the researcher's personal interests, as well as offering recommendations to the SW service and individuals who are trying to lose weight independently. Furthermore, the research also progressed the current MT literature. The researcher was conscious that the interview process may be impacted by the way she was perceived. Her gender and healthy BMI classification could have been relevant when discussing dietary behaviours and physical activity patters of participants who ranged from having a normal to obese BMI. Furthermore, being a female researcher may have effected how the males responded during the interview. However, the researcher noticed the openness of all participants who discussed personal topics such as overeating, eating disorders and depression. The researchers PhD supervisors were male, and their main role was to discuss the themes and comment on whether the themes appeared appropriate, it was beneficial to also gain a male perspective. Like in the previous study, the researcher deemed it useful to have these second perspectives, and it assisted in forming a clearer interpretation of the data.

Strengths, Limitations, and Future Directions

Strengths. A strength of this research was that this is the first study to employ the vignette methodology within the MT domain. The vignette approach enabled deeper understanding of the attitudes and belief of the low mentally tough individuals. The more prospective approach is less reliant on recall. Furthermore, the discussion of a uniform situation enabled direct comparison between participants to be drawn. Additionally, the inclusion of two participants from Chapter Six allowed changes in one's attitudes towards weight loss to be captured.

Limitations. As with all studies, limitations were present. A potential limitation is that the responses provided may not reflect the individuals' perceptions

and beliefs of Sam. Discussing a character can elicit socially desirable responses as opposed to their own response (Barter & Renold, 2000). Although *would* questions were employed as opposed to *should* questions, potentially the vignette may have addressed more morals than actual perceptions of behaviours of some participants. Additionally, the female heavy sample means that the findings cannot be assumed to be applicable to males. Furthermore, data from the high mentally tough individuals was not collected, thus comparison in attitudes and perceptions between high and low mentally tough individual could not be made.

Future directions. Future work could conduct the vignette when individuals are about to embark on their pursuit of a weight loss goal, as well as during, and after a set amount of time, working towards weight loss. The responses can be compared as the individual progresses along the weight loss journey. This method would allow a direct comparison of perceptions towards losing weight at various points of the weight loss journey. Future research is also warranted into the mechanisms that underpin the learnt coping mechanisms (i.e., did MT increase, or were skills and strategies learnt to circumnavigate having a low MT?).

Applied Recommendations

The study provides recommendation for providing social support to low mentally tough individuals, who appear to have a desire to feel valued within the support network, thus assigning individuals a specific role may achieve this. This research has highlighted the potential for growth in the skills and characteristics associated with MT amongst low mentally tough individuals. It appears that strategies to reduce options in behaviours (e.g., whether to snack), and offer potential punishments for certain behaviours, may be effective interventions to assist low MT individuals weight loss progress. To help promote long term behaviour change

offering attribution training, alongside a form of punishment training, may help low MT individuals to feel in control of their behaviours in the long term when the punishment intervention is removed (Clough & Strycharczyk, 2015). The sense of self-control and autonomy may enhance weight loss maintenance in the long term (McKee et al., 2013; Koestner et al., 2008).

Conclusion

The final study of the thesis has addressed the fifth research objective, and has identified psychological factors (e.g., perceptions, beliefs, attitudes) that influence low MT individuals leading a healthy lifestyle in order to lose weight. This study provides a deeper insight into the perceptions of the LMTG, a population which Study Four identified as under-researched in contrast to the high mentally tough individuals who have received extensive research attention (e.g., Crust, Swann et al., 2014; Cook et al., 2014). The findings of this study contribute to the current body of MT literature, as well as extends the work in Chapter Six, by further understanding the experiences and behaviours of the low mentally tough individuals. The findings also extended the current work within this thesis and continued to investigate whether MT which has stemmed from elite sport can be applied to HRLF, an in-depth discussion on this question is discussed in the proceeding chapter.

Key findings include the potential to enhance the healthiness of lower mentally tough individuals' lifestyle behaviour, by modifying the perceptions of their behaviour choices, and potential for interventions such as *punishment environments* alongside PST. A further important finding of this study was that low MT can result in negative perceptions even when the healthiest option is selected. This implies it may not necessarily be purely the coping mechanisms for challenging

situations which needs to be addressed, but also how to perceive and interpret the behaviours displayed. Furthermore, the vignette phase progresses the MT literature, a novel approach within MT research.

Chapter Eight: General Discussion and Conclusions

Overview

The findings of the five studies presented in this thesis were reported and discussed in their respective chapters (Chapters Three – Seven). This final chapter aims to present the most important findings by discussing the studies collectively, and demonstrate the original contribution this thesis has added to the current body of knowledge. The most salient findings will be discussed, as well as the strengths, limitations, future directions and applied recommendations of this work. The section will conclude with an overall summary of the research.

The overarching aim of this thesis was to investigate MT in relation to HRLF that can contribute to weight loss (i.e., physical activity, dietary behaviours, and psychological wellbeing). This research sought primarily to gain a deeper understanding of MT in relation to modifying HRLF in order to lose weight, which is an appropriate topic given the obesity and overweight prevalence (i.e., over half the UK adult population being overweight or obese; PHE, 2016). Thus, whilst there may be alternative perspectives available on the factors that influenced the participant's behaviour change (e.g., changes in self-efficacy), this thesis adopted a 'MT lens' and focused on the role of MT in HRLF and weight loss. Furthermore, the multidimensional and holistic nature of the concept of MT enables incorporation of theories and psychological skills that can potentially offer explanation for the findings (e.g., self-efficacy, goal setting).

Amongst the studies presented in this thesis, there were a number of salient findings that offer a significant contribution to the current body of literature.

Main Contributions of this Thesis

The contributions of each study are discussed in their respective chapters. The main contributions of the whole thesis are summarised in Figure 8.1. The current study reported that MT held a predominantly non-significant relationship with weight loss success. This finding is contradictory to the previous work that reported MT was significantly and positively related to outcome measures, such as grades of first year university students (Crust, Earle, et al., 2014), academic and social goal achievement amongst students (Gucciardi et al., 2015), and place in the business hierarchy (Marchant et al., 2009). It emerged that differences between the high and low mentally tough individuals do not exist between their outcome (i.e. weight lost, weight gained), but the process (i.e., strategies adopted to lose weight, attitude towards weight loss, motivation to lose weight) when pursuing a weight loss goal.

Differences between the current research and previous MT and outcome measure studies (e.g., Crust, Earle, et al., 2014) may be attributed to the nature of the domain being researched. For example, MT is associated with an individual achieving their goals (Hardy et al., 2013), which in the case of sport or education there is a clear end point that is stable and cannot be taken away from the individual (e.g., degree/medal). Leading a healthy lifestyle, however, has no defined end point; adopting a healthy lifestyle can enable one to reach their target weight, but the target weight is not a stable end point due to the possibility of weight regain. If the individual becomes complacent and reduces their physical activity levels or consumes a less heathy diet, their weight can increase and their goal achievement is theoretically *lost*. Lifestyle behaviours are more of a continuous process that must be frequently considered if one is to achieve and maintain a weight loss goal, not just

Figure 8.1. An Overview of the Main Contributions of This Thesis.

during times such as training, competition, and working hours, but in many aspects of life, irrespective of the situation. It is this element of an *unstable goal achievement* that has the potential to offer a valuable contribution to the current MT literature, which has focused on the achievement of stable goals (e.g., sporting medals or a university degree). Therefore, MT appeared to be of little benefit in terms of health

outcomes (e.g., no difference in weight loss), but MT played a substantial role in the processes of being healthy (e.g., differences in support required). This single difference in domains appeared to have a relatively large impact.

The first-hand accounts of the participants' experiences offered a deeper insight into the understanding of the characteristics of high and low mentally tough individuals. A more realistic understanding of the mentally tough participants was gained, as it transpired that high mentally tough individuals can display less effective coping mechanisms, such as emotional eating. Such findings move away from the unrealistic image of MT that is based on participants being asked to describe an *ideal* mentally tough individual (Andersen, 2011). It appeared that the high and low mentally tough individuals could benefit from support, and irrelevant of MT all participants had the potential to lose weight (Chapters Three and Four). It was the experiences during the pursuit of the weight loss goal that were reported to be different between high and low mentally tough individuals (Chapter Six).

Gaining an insight into the experiences, perceptions, and attitudes of low mentally tough individuals (Chapters Six and Seven) progressed previous work, which has predominantly focused on mentally tough individuals and how they developed their MT (e.g., Thelwell et al., 2010). The low mentally tough individuals appeared to require more support than the high mentally tough individuals. Control was an important factor for the low mentally tough individual's weight loss pursuit. Most of those who were successful at weight loss reported either gaining a sense of control, or adopting strategies to circumnavigate their low levels of control. For example, one may accept that they may have a low level of control around food when they are hungry so they will go food shopping when they are not hungry, or shop online to reduce temptation when seeing the less healthy food. Furthermore, it

appeared the majority of the low MT individuals could benefit from increasing some components of MT (e.g., confidence, emotional control).

One of the key attributes that distinguished between the successful and unsuccessful weight loss of the high mentally tough individuals was the priority of their weight loss goal. Amongst the high mentally tough group it emerged that generally their attitudes to adopting healthy lifestyle behaviours depended on the value they placed on their goal to lose weight. Those who appeared to value weight loss were more successful at losing weight, which is analogous to Hutchinson et al. (2014) who reported that valued goals are more likely to be achieved. It emerged that the high mentally tough individuals appeared to have relatively robust skills to aid weight loss (e.g., confidence, intrinsic motivation), but still relied upon aspects of support, such as informational support. This finding that MT does not necessarily result in goal achievement challenges previous definitions that proposed MT is related to achieving goals (e.g., Hardy et al., 2013). It would appear more appropriate to add to the definition of MT that it is related to achieving goals *of perceived importance* to the individual.

Strengths, Limitations, and Future Directions

The relevant strengths, limitations, and future directions of each study are discussed in their respective chapters. Overarching strengths, limitations, and future directions are presented below.

Strengths. Strengths of this research were:

- Taking a multidimensional approach to MT by adopting the 4C's model, as opposed to other unidimensional approaches and measures (e.g., Gucciardi et al., 2015), captures the complexity of the concept. The MTQ48 enabled

specific components of MT to be identified that are most correlated with the HRLF, which can then be targeted during interventions.

- The longitudinal design enabled the participants' change in body weight to be monitored over a set time period (Howitt & Cramer, 2005). The changes in body weight were then investigated in relation to MT.
- A mixed-methods approach allowed a deeper understanding of the reported relationships between MT, and weight loss progress and HRLF. This was an important element of the current thesis considering the unexpected relationships and findings reported in Chapters Four and Five (e.g., MT and weight loss held a non-significant relationship, and achievers and non-achievers of their target weight did not have a significant difference in MT).
- The selection criteria used to explore the experiences of one's pursuit of a weight loss goal was based on a quantifiable measure (i.e., the MTQ48), as opposed to the commonly used level of success to sample participants in MT research (e.g., Jones et al., 2007). This is a particularly important strength considering success of weight loss was not related to MT (Chapters Three and Four).
- Including low mentally tough individuals expands the current body of MT literature, which is predominantly based on high mentally tough individuals (e.g., Jones et al., 2007). This provided characteristics of low MT individuals (e.g., high reliance on social support), as well as methods of supporting the low MT individuals (e.g., offering strategies to circumnavigate low levels of control).
- Chapter Seven presented the first study to adopt a vignette approach within the MT literature, which offered an alternative method that captured attitudes

and beliefs of the participants with differing MT levels. As well as revealing congruent findings with Study Four, the vignette approach enabled a deeper understanding of the low MT attitudes and values. For example, most of the low MT participants held the belief that social support should enhance one's self worth.

Limitations. Limitations of the current research included:

- The population investigated in this thesis was predominantly a female sample in all studies. This may be attributed to the lower body dissatisfaction reported by women compared to men (Mellor, Fuller-Tyszkiewicz, McCabe & Ricciardelli, 2010), and thus they may be more likely to participate in a weight loss study. Males may believe that they should abide by social norms (e.g., eat large amounts, and consume what is served as opposed to being picky), and that health and a lean body are feminine topics (Sabinsky, Toft, Raben & Holm, 2007). These factors may restrict males' willingness to participate in the study as they do not want to be perceived as going against social norms. Furthermore, the population investigated in Chapter Three was university students, and Chapters Four-Seven were individuals who held a desire to lose weight. Thus, the findings of these studies are limited to their respective populations.
- Attrition posed a potential limitation, which would be expected considering the longitudinal nature of the studies presented in Chapters Four and Five. The attrition can lead to bias (Durnville, Torgerson & Hewitt, 2006), comparisons between the non-completers and non-completers of this sample revealed that MT was not significantly different. However, there may be alternative contributing factors, which were not measured, that differentiated

between those who completed and those who did not complete all data collection points.

- The research relied on self-report questionnaires (e.g., MTQ48, EITI) to collect data. This can result in response bias due to participants providing socially desirable responses (Mortel, 2008). Furthermore, self-report data can lead to less reliable results due to participants not reading the questions properly, to address this reliability was assessed using Cronbach alpha.
- To enable a large sample size for the studies, online questionnaires were distributed. The researcher has low control over online questionnaires, which can potentially influence the participants' responses (e.g. accuracy). Furthermore, using online questionnaires restricts participation to people who have internet access and an e-mail account.
- The reduction in the questionnaires administered following the first study restricted the findings of this thesis. The SPWB questionnaire was not included in the second study due to SW's concerns over providing their members with too many questions; this limited the extent that MT and psychological wellbeing was explored. Nevertheless, interesting findings were reported in relation to MT and psychological wellbeing amongst university students. Eating behaviours and physical activity levels were a focus of subsequent studies (Study Four and Five), which appears appropriate considering they are the most modifiable components of lifestyle (Cockerham, 2005).

Future Directions. Recommendations for future research included:

- Investigating samples that have a high proportion of male participants would address the low male participation rates. Males are particularly important to

sample due to their greater prevalence of being overweight or obese (66.4%) compared to females (57.5%; PHE, 2016). To achieve this, how the study is presented and participants are recruited will need to be considered to overcome the potential barriers imposed by social norms of males and body weight, and body image, as discussed above. For example, participants could be recruited through a setting that attracts males in a circumstance that feels 'right' as opposed to threatening (e.g., a football club). Such a setting may be perceived more socially acceptable for a male to participate if the activity is congruent with, instead of challenging, common ideals of muscularity (Hunt et al., 2014). Furthermore, future research could investigate barriers and facilitators of male participation in studies investigating weight loss and behaviour change. This could inform future work how to effectively recruit male participants.

- Use of direct measurements to assess the HRLF (e.g., accelerometery data to measure physical activity) in relation to MT, as opposed to self-report measures.
- Testing the proposed applied recommendations for tailoring support programmes for high and low mentally tough individuals, by conducting longitudinal intervention research with people who wish to lose weight.
- Exploring whether goal priority remains a crucial factor in the attainment of a goal amongst mentally tough individuals in domains outside of lifestyle behaviours. For example, investigating the goal attainment of mentally tough individuals in areas that they perceive as important and possess valued goals, and areas that they do not perceive as important and hold valued goals for.

- Offer additional support to the participants following their interview. For example, providing contact numbers for appropriate support organisations that were relevant to the topics discussed (e.g., mental illness and eating disorders). All participants who mentioned that they were depressed or had an eating disorder discussed that they were actively seeking medical help. Furthermore, it should be noted that although participants may have mentioned that they had a medical condition (e.g., depressed), this does not enable a diagnosis or provide evidence that they are, which would need to be assessed by a medical professional in accordance with the NHS guidelines.

Applied Recommendations

The primary benefits of this thesis can inform practitioners and academics. Examples of how the findings can be implemented are provided. Separate recommendations for high and low mentally tough individuals have provided suggestions for tailored lifestyle behaviour change programmes to achieve weight loss (Table 8.1). The recommendations comprised of support that can be provided, modifications to the environment, and identification of the most suitable MT components to target. Capturing the experiences, perceptions, and attitudes of participants in Chapters Six and Seven informed the applied recommendations for MT and weight loss (Table 8.1). In relation to the benefits to the SW service, two approaches can be taken: (a) screen participants using the MTQ48 and offer tailored support programmes depending on their MT level, for example ensuring frequent support is available for the low MT members; or (b) ensure a range of support is available to members, so that they can draw upon the support suited to their MT level. For example, high MT members will seek the information and facts regarding weight loss, whereas low MT individuals will rely on the emotional support provided by the service. Whereas

practitioners and researchers may adopt a number of the applied recommendations, the SW service already offers services such as peer support (Slimming World, 2016). Therefore, SW can utilise those that are not part of their service, such as attribution training, which could be provided for low MT individuals.

A set of recommendations were also presented for higher education institutes (Table 8.2) due to the reported relationship between MT and HRLF in university students. The relationships reported in Chapter Three informed the recommendations for universities. Higher education institutes could implement the findings in two main ways: (a) screen students using the MTQ48 and enhance MT of the low mentally tough individuals, by providing appropriate interventions. Students could be screened before entering the university environment via the MTQ48. Those who are identified as *at risk* of weight gain, or not coping effectively, can receive targeted interventions. It may be beneficial to provide support prior to attending university. Once attending university, the institute can ensure that support is available; or (b) modify the environment to assist the lower mentally tough individuals to lead a healthy lifestyle. For example, offering beginner exercise classes or cooking classes to enhance confidence in abilities.

On a wider scale, the work could inform government initiatives to promote behaviour change. For example, raising awareness and importance of a healthy lifestyle and weight loss to enhance goal priority of the mentally tough individuals. Alternatively, offering support programmes to provide emotional support, such as peer support groups, may be appropriate to target the low mentally tough individuals.

Table 8.1

Applied Recommendations for Tailored Weight Loss Support Based on Mental Toughness

Support	High Mentally tough	Low mentally tough
Goal priority	Inform individuals of the importance of adopting healthy behaviours and weight loss. Encourage behaviour change and weight loss to become a prioritised goal.	---
Social support	Provide informative support to enable knowledge and ways of changing HRLF, for example offering information about nutritious dietary consumption. Provision of support should be available when required, so when a challenging time is experienced there is support available.	Offer support from multiple sources (e.g., face-to-face, online support), and make individuals feel valued within the support network. Also, promote a community feel within the support system, for example peer support. Provide emotional support to assist coping with setbacks. Continue support once target weight has been reached.
Motivation	Offer intrinsic motivation by setting task goals to encourage self-improvement. Set ego goals to provide a competitive element.	Provide extrinsic motivation, such as rewards, praise, and certificates, which can be received when a goal is reached (e.g., weight loss goal, reached set number of exercised sessions)
Confidence	---	Enhance confidence through strategies such as praise. Increase interpersonal confidence, so one is comfortable in being different to others in situations where the majority chose the less healthy option. Offer beginner exercise sessions to reduce comparisons to people who are fitter/more skilled. Teach psychological skills such as imagery, to imagine overcoming challenging situations, which can enhance confidence.
Control	---	Teach strategies to avoid the loss of control (e.g., not shopping when hungry). Offer attribution training to enhance one's control component of MT, by encouraging individuals to attribute success to their abilities and skills, as opposed to external forces that they do not have control over.
Perceptions	Alter perceptions so leading a healthy lifestyle and losing weight is perceived as important and a priority to address.	Encourage the perceptions of weight loss to be positive, by enhancing the challenge component of MT, for example increasing familiarity with change. This can enable the participants to be more open to new experiences, for example trying new and healthier foods.

Table 8.2

Applied Recommendations for Health-Related Lifestyle Factors Based on Mental Toughness in University Students

Health related lifestyle factor	MT interventions	Environmental modifications
Physical activity	Exercise milieu was most strongly related to MT, specifically the life control component. Thus, individuals can be taught effective time management and planning prior to university to ensure that barriers such as travelling to facilities etc. can be managed and overcome.	Physical exertion was the strongest barrier to exercise, which was most significantly correlated to the MT component confidence in abilities. Offering beginner classes that gradually build up the intensity and skill of the class, so one's confidence in abilities can be enhanced, may promote exercise adherence.
Dietary behaviour	The challenge component of MT was significantly related to picky eating. Therefore, the challenge component can be targeted, for example making individuals more familiar with new experiences may expand the range of new foods consumed.	Commitment was significantly related to healthy eating, therefore higher education institutes may set goals and offer rewards to enhance the individual's commitment, for example eating a set number of healthy meals in the canteen results in one free meal.
Psychological wellbeing	Autonomy was the lowest scoring sub component of psychological wellbeing amongst the students, which was most strongly related to the MT component interpersonal confidence. Therefore, increasing one's confidence, for example through enhancing problem solving skills, can assist the individual to become more independent and work autonomously.	Environmental mastery was most strongly related to MT. Confidence in abilities predicted environmental mastery. Therefore, providing students with skills (e.g., cooking skills) at a college level (16-18 year olds) can ensure the students feels ready for the higher education environment, for example manage basics tasks such as making a meal. Once at university readily available support to manage factors such as stress or multiple demands of their environment should be available for students.

Conclusion

The primary aim of this thesis was to expand the application of MT being a beneficial trait within sport, business, and education, to the domain of HRLF; an important topic considering the high rates of obesity and overweight prevalence (PHE, 2016). The overarching aim was broken down into five specific research objectives, which informed the research conducted in this thesis.

The first research objective of this thesis sought to investigate HRLF in a population at risk of adopting an unhealthy lifestyle and gaining weight (i.e., university students). Physical activity level declined in 31% of the participants, and their MT was significantly related to eating identity components. The MT of regular exercisers *(M* = 3.43 ± .42) was significantly greater than non-regular (*M* = 3.24 ± .54, $p < .05$). Components of exercise barriers, eating identity, and psychological wellbeing were significantly related to MT. Thus, this provided a rationale for further investigation into MT in relation to HRLF. This study acknowledged that MT was related to achieving goals, and leading a healthy lifestyle may not have been a goal that the students wished to achieve.

The second research objective of this thesis was to investigate MT in relation to weight loss and eating identity in individuals who specifically wanted to lose weight and were members of SW. Overall MT was not significantly related to weight loss ($r = -.15$, $p > 0.05$). Predominantly, non-significant relationships were reported between individual MT components and weight loss. The SW service may have created a ceiling effect. For example, mentally tough individuals use strategies such as goal setting (Crust & Azadi, 2010) and are self-motivated (Cook et al., 2014), and the SW service provides motivational support and helps the individual set a weight

Figure 8.2. An Overview of Each Objective, the Outcome, and Salient Findings.

Note: RO = research objective

loss goal they would like to achieve, which is broken down into smaller goals (Slimming World, 2016). Therefore, the skills that a high mentally tough individual may naturally possess, SW offers to the members, including those with a lower MT. A further study to investigate weight loss in non-slimming club members was suggested to provide a comparison.

The third research objective of this thesis investigated MT in relation to weight loss and eating identity in non-slimming club members. Non-significant relationships were reported between MT and weight loss over the six months (r = -.21, p > 0.05). A non-significant relationship was reported between the MT of individuals who achieved their target weight (M = 3.62 ± .49), and individuals who did not achieve their target weight (M =3.42 ± .38, p > 0.05). These findings contrasted previous work (e.g., Gucciardi et al., 2015) that reported significant relationships between MT and academic and social goal achievement. A logical step was to identify experiences of the high and low mentally tough individuals' pursuit of a weight loss goal, to identify why the current research appeared to contrast the majority of MT work, as well as offer explanations of the non-significant relationships.

The fourth research objective of this thesis (Chapter Six) was to investigate the experiences of high and low mentally tough individuals' pursuit of a weight loss goal. Salient findings included that the high mentally tough individuals appeared to be generally successful at weight loss if they prioritised their weight loss goal. However, if other goals took priority weight loss success was less likely. The high mentally tough individuals appeared to have a relatively robust skill set to achieve their prioritised goals (e.g., confidence, commitment). The low mentally tough individuals appeared capable of achieving a goal if effective strategies were in place

(e.g., methods to circumnavigate low levels of control, being externally motivated, and receiving social support). Enhancing MT components such as confidence also emerged as important to increase weight loss success in low MT individuals. The low mentally tough individuals were recognised to require more support, and as an under-researched group within the MT literature, and therefore required further research attention

The fifth research objective was to investigate the attitudes, perceptions, and beliefs, of the low MT individuals' pursuit of a weight loss goal. The vignette approach extended the understanding of the low mentally tough individuals. For example, Chapter Six reported that social support was important, whereas Chapter Seven captured the importance of the social support providing the individual with a sense of self-worth and a community feel. The deeper insight developed the understanding of how to offer the low mentally tough individuals support.

Overall, the key contribution made by this thesis was that MT is not related to an outcome (i.e., weight loss) when modifying lifestyle behaviours. Obtaining first-hand accounts displayed high and low MT individuals are not polar opposites, and both can have successful and unsuccessful periods during their weight loss pursuit. This finding challenged the previous definitions that suggested MT is related to achieving goals; it appears MT assists in reaching goals of a high priority. It emerged that the high mentally tough individuals can require help, and suggestions to support the high MT individuals are proposed. Furthermore, characteristics and ways to assist the low MT individuals including individual support and environment modifications are proposed, which is a valuable addition to the under-researched group. Therefore, the current thesis adds a valuable contribution to the current body of knowledge on MT, and also HRLF and weight loss, by expanding the

understanding of the concept of MT. It appears that high mentally tough individuals do not always achieve their goals, and low mentally tough individuals can achieve their goals with appropriate support. This key finding also challenges the current understanding of the relationship between MT and goal achievement.

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Appendices

Appendix A: Study One Participation Recruitment

Hello,

This is an invitation to participate in an interview that aims to explore psychological characteristics and lifestyle choices. If you would like further information, or wish to participate please click on the link below.

[Insert link]

Please be aware that it does not affect your university grade whether you chose to participate or not.

If you have any questions please contact estamp@lincoln.ac.uk

Thank you for your time.

Kind regards,

Lizzie

Appendix B: Study One Participant Information and Informed Consent

Participant Information Sheet

Study title: Relationship between individual characteristics and lifestyle

Dear Sir / Madam,

This letter is to invite you to participate in a research study concerning the relationship between individual characteristics and lifestyle. Participation in this research is voluntary.

Purpose and Background:

The purpose of this study is to understand university student's transition from living at home to moving away to University. Additionally, the study aims to identify the relationship between individual characteristics and lifestyle. The purpose of this research is to contribute to a PhD thesis.

Procedures:

The study involves completion of a questionnaire pack involving 6 questionnaires which will take approximately 25 minutes to complete. This includes background questions to the individual, assessment about your self-perceptions and typical responses to everyday situations, levels of physical activity and eating habits.

Benefits:

The information collected will be analysed and written up in a report that will form part of a PhD. This report will not contain reference to any individual data and you will not be identified. The study may also aid in improving interventions to promote a healthier lifestyle in the student population. No material rewards are given to you for participation in this research.

Risks:

The only potential risk associated with participation in this project concerns the leakage of personal information. To ensure that this does not occur, data will be stored securely and no names will be attached to any of the collected data – thus meaning that no individual involved in the project can be identified.

Freedom to withdraw:

You are free to withdraw from the study at any time. Upon such a request, no further data will be collected although any data collect so far may be kept.

Confidentiality:

No names will be attached to collected data. This coded data will then be analysed by the research team. The research team will only know you as a code number. Data sheets will be stored in a locked cabinet and on a password protected computer to which only the researchers will have access.

Who has reviewed the study?

The study has been reviewed by the School of Sport and Exercise Science, University of Lincoln Research Ethics Committee.

Contact details for further information:

Lizzie Stamp, The University of Lincoln, Brayford Pool, Lincoln, LN6 7TS. Tel: 01522 886803. E-mail: estamp@lincoln.ac.uk

If you wish to participate in this study, please tick the box to provide consent to participate in this study.

Do you understand that you have been asked to take part in a research study?

Have you received and read a copy of the Information Letter?

Do you understand that you are free to refuse to participate, or to withdraw from the study at any time, without consequence?

Appendix C: Mental Toughness Questionnaire (MTQ48)

Please indicate your responses by placing a cross in the appropriate box. Please answer these items carefully, thinking about how you are generally. Do not spend too much time on any one item.

		Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
1	I usually find something to motivate me	1	2	3	4	5
2	I generally feel in control	1	2	3	4	5
3	I generally feel that I am a worthwhile person	1	2	3	4	5
4	Challenges usually bring out the best in me	1	2	3	4	5
5	When working with other people I am usually quite influential	1	2	3	4	5
6	Unexpected changes to my schedule generally throw me	1	2	3	4	5
7	I don't usually give up under pressure	1	2	3	4	5
8	I am generally confident in my own abilities	1	2	3	4	5
9	I usually find myself going through the motions	1	2	3	4	5
10	At times I expect things to go wrong	1	2	3	4	5
11	'I just don't know where to begin' is a feeling I usually have when presented with several things to do at once	1	2	3	4	5
12	I generally feel that I am in control of what happens in my life	1	2	3	4	5
13	However bad things are, I usually feel they will work out positively in the end	1	2	3	4	5
14	I often wish my life was more predictable	1	2	3	4	5
15	Whenever I try to plan something, unforeseen factors usually seem to wreck it	1	2	3	4	5
16	I generally look on the bright side of life	1	2	3	4	5
17	I usually speak my mind when I have something to say	1	2	3	4	5
18	At times I feel completely useless	1	2	3	4	5

19	I can generally be relied upon to complete the tasks I am given	1	2	3	4	5
20	I usually take charge of a situation when I feel it is appropriate	1	2	3	4	5
21	I generally find it hard to relax	1	2	3	4	5
22	I am easily distracted from tasks that I am involved with	1	2	3	4	5
23	I generally cope well with any problems that occur	1	2	3	4	5
24	I do not usually criticise myself even when things go wrong	1	2	3	4	5
25	I generally try to give 100%	1	2	3	4	5
26	When I am upset or annoyed I usually let others know	1	2	3	4	5
27	I tend to worry about things well before they actually happen	1	2	3	4	5
28	I often feel intimidated at social gatherings	1	2	3	4	5
29	When faced with difficulties I usually give up	1	2	3	4	5
30	I am generally able to react quickly when something unexpected happens	1	2	3	4	5
31	Even when under considerable pressure I usually remain calm	1	2	3	4	5
32	If something can go wrong, it usually will	1	2	3	4	5
33	Things just usually happen to me	1	2	3	4	5
34	I generally hide my emotions from others	1	2	3	4	5
35	I usually find it difficult to make a mental effort when I am tired	1	2	3	4	5
36	When I make mistakes I usually let it worry me for days after	1	2	3	4	5
37	When I am feeling tired I find it difficult to get going	1	2	3	4	5
38	I am comfortable telling people what to do	1	2	3	4	5
39	I can normally sustain high levels of mental effort for long periods	1	2	3	4	5
40	I usually look forward to changes in my routine	1	2	3	4	5
41	I feel that what I do tends to make no difference	1	2	3	4	5
42	I usually find it hard to summon enthusiasm for the tasks I have to do	1	2	3	4	5
43	If I feel someone is wrong, I am not afraid to argue with them	1	2	3	4	5
44	I usually enjoy a challenge	1	2	3	4	5
45	I can usually control my nervousness	1	2	3	4	5

46	In discussions, I tend to back-down even when I feel strongly about something	1	2	3	4	5
47	When I face setbacks I am often unable to persist with my goal	1	2	3	4	5
48	I can usually adapt myself to challenges that come my way	1	2	3	4	5

Appendix D: International Physical Activity Questionnaire (IPAQ)

These questions are about the amount of time you have spent being active in the last 7 days.
In answering the following questions, **vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

During the last 7 days, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling,? Think about *only* those physical activities that you did for at least 10 minutes at a time.

How much time in total did you usually spend on one of those days doing vigorous physical activities*?*

Again, think *only* about those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

How much time in total did you usually spend on one of those days doing moderate physical activities*?*

During the last 7 days, on how many days did you **walk** for at least 10 minutes at a time? This includes walking at work and at home, walking to travel from place to place, and any other walking that you did solely for recreation, sport, exercise or leisure.

How much time in total did you usually spend walking on one of those days*?*

The last question is about the time you spent sitting on weekdays while at work, at home, while doing course work and during leisure time. This includes time spent sitting at a desk, visiting friends, reading traveling on a bus or sitting or lying down to watch television.

During the last 7 days, how much time in total did you usually spend sitting on a week day?

Appendix E: Exercise Benefits and Barriers Scale (EBBS) Barrier Scale

Below are statements that relate to ideas about exercise. Please indicate your response to the following items by selecting one of the letters, which have the following meaning; SA = strongly agree, A = agree, D = disagree, or SD = strongly disagree

Scale: strongly agree, agree, disagree, strongly disagree

The last question is about the time you spent sitting on weekdays while at work, at home, while doing course work and during leisure time. This includes time spent sitting at a desk,

	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
1. Exercising takes too much of my time	1	2	3	4	5
2. Exercise tires me	1	2	3	4	5
3. Places for me to exercise are too far away.	1	2	3	4	5
4. I am too embarrassed to exercise	1	2	3	4	5
5. It costs too much to exercise	1	2	3	4	5
6. Exercise facilities do not have convenient schedules for me	1	2	3	4	5
7. I am fatigued by exercise	1	2	3	4	5
8. My spouse (or significant other) does not encourage exercising	1	2	3	4	5
9. Exercise takes too much time from family relationships	1	2	3	4	5
10. I think people in exercise clothes look funny	1	2	3	4	5
11. My family members do not encourage me to exercise	1	2	3	4	5
12. Exercise takes too much time from my family responsibilities	1	2	3	4	5
13. Exercise is hard work for me	1	2	3	4	5
14. There are too few places for me to exercise	1	2	3	4	5

Appendix F: Eating Type Identity Inventory (EITI)

Please indicate how much you agree with each of the following statements by choosing whether you strongly disagree, disagree, neither disagree nor agree, agree, or strongly agree.

	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree
1. You are a healthy eater	1	2	3	4	5
2. You are someone who eats in a nutritious manner	1	2	3	4	5
3. You are someone who is careful about what you eat	1	2	3	4	5
4. You are someone who eats more when sad or depressed	1	2	3	4	5
5. You are someone who eats more when stressed or anxious	1	2	3	4	5
6. You are an overeater	1	2	3	4	5
7. You are a meat eater.	1	2	3	4	5
8. You are someone who likes meat with every meal	1	2	3	4	5
9. You are a junk food eater	1	2	3	4	5
10. You are a picky eater.	1	2	3	4	5
11. You are someone who likes to try new foods.	1	2	3	4	5
12. You are someone who likes to eat a lot of different things.	1	2	3	4	5

Appendix G: Scales of Psychological Wellbeing (SPWB)

The following set of questions deals with how you feel about yourself and your life. Please remember that there are no right or wrong answers.

Circle the number that best describes your present agreement or disagreement with each statement.	Strongly Disagree	Disagree Somewhat	Disagree Slightly	Agree Slightly	Agree Somewhat	Strongly Agree
1. Most people see me as loving and affectionate.	1	2	3	4	5	6
2. I often change my mind about decisions if my friends or family disagree.	1	2	3	4	5	6
3. In general, I feel I am in charge of the situation in which I live.	1	2	3	4	5	6
4. I am not interested in activities that will expand my horizons.	1	2	3	4	5	6
5. I do not enjoy being in new situations that require me to change my old familiar ways of doing things.	1	2	3	4	5	6
6. When I look at the story of my life, I am pleased with how things have turned out.	1	2	3	4	5	6
7. Maintaining close relationships has been difficult and frustrating for me.	1	2	3	4	5	6
8. I am not afraid to voice my opinions, even when they are in opposition to the opinions of most people.	1	2	3	4	5	6
9. The demands of everyday life often get me down.	1	2	3	4	5	6
10. I have not experienced many warm and trusting relationships with others.	1	2	3	4	5	6
11. I live life one day at a time and don't really think about the future.	1	2	3	4	5	6
12. In general, I feel confident and positive about myself.	1	2	3	4	5	6
13. I often feel lonely because I have few close friends with whom to share my concerns.	1	2	3	4	5	6

14. My decisions are not usually influenced by what everyone else is doing.	1	2	3	4	5	6
15. I do not fit very well with the people and the community around me.	1	2	3	4	5	6
16. Some people wander aimlessly through life, but I am not one of them.	1	2	3	4	5	6
17. I tend to focus on the present, because the future nearly always brings me problems.	1	2	3	4	5	6
18. I feel like many of the people I know have gotten more out of life than I have.	1	2	3	4	5	6
19. I enjoy personal and mutual conversations with family members or friends.	1	2	3	4	5	6
20. I tend to worry about what other people think of me.	1	2	3	4	5	6
21. I am quite good at managing the many responsibilities of my daily life.	1	2	3	4	5	6
22. I don't want to try new ways of doing things - my life is fine the way it is.	1	2	3	4	5	6
23. For me, life has been a continuous process of learning, changing, and growth.	1	2	3	4	5	6
24. It's difficult for me to voice my own opinions on controversial matters.	1	2	3	4	5	6
25. My attitude about myself is probably not as positive as most people feel about themselves.	1	2	3	4	5	6
26. Being happy with myself is more important to me than having others approve of me.	1	2	3	4	5	6
27. I often feel overwhelmed by my responsibilities.	1	2	3	4	5	6
28. I think it is important to have new experiences that challenge how you think about yourself and the world.	1	2	3	4	5	6
29. My daily activities often seem trivial and unimportant to me.	1	2	3	4	5	6
30. I like most aspects of my personality.	1	2	3	4	5	6

31. I don't have many people who want to listen when I need to talk.	1	2	3	4	5	6
32. I tend to be influenced by people with strong opinions.	1	2	3	4	5	6
33. I sometimes feel as if I've done all there is to do in life.	1	2	3	4	5	6
34. When I think about it, I haven't really improved much as a person over the years.	1	2	3	4	5	6
35. I don't have a good sense of what it is I'm trying to accomplish in life.	1	2	3	4	5	6
36. I made some mistakes in the past, but I feel that all in all everything has worked out for the best.	1	2	3	4	5	6
37. There is truth to the saying that you can't teach an old dog new tricks.	1	2	3	4	5	6
38. I know that I can trust my friends, and they know they can trust me.	1	2	3	4	5	6
39. I generally do a good job of taking care of my personal finances and affairs.	1	2	3	4	5	6
40. I have difficulty arranging my life in a way that is satisfying to me.	1	2	3	4	5	6
41. I used to set goals for myself, but that now seems like a waste of time.	1	2	3	4	5	6
42. In many ways, I feel disappointed about my achievements in life.	1	2	3	4	5	6
43. It seems to me that most other people have more friends than I do.	1	2	3	4	5	6
44. The past had its ups and downs, but in general, I wouldn't want to change it.	1	2	3	4	5	6
45. I gave up trying to make big improvements or changes in my life a long time ago.	1	2	3	4	5	6
46. When I compare myself to friends and acquaintances, it makes me feel good about who I am.	1	2	3	4	5	6
47. I enjoy making plans for the future and working to make them a reality.	1	2	3	4	5	6

48. I have been able to build a home and a lifestyle for myself that is much to my liking.	1	2	3	4	5	6
49. People would describe me as a giving person, willing to share my time with others.	1	2	3	4	5	6
50. I have confidence in my opinions, even if they are contrary to the general consensus.	1	2	3	4	5	6
51. I am good at juggling my time so that I can fit everything in that needs to be done.	1	2	3	4	5	6
52. I have a sense that I have developed a lot as a person over time.	1	2	3	4	5	6
53. I am an active person in carrying out the plans I set for myself.	1	2	3	4	5	6
54. I judge myself by what I think is important, not by the values of what others think is important.	1	2	3	4	5	6

Appendix H: Study Two Participant Information and Informed Consent

Participant Information Sheet

Study title: Relationship between individual characteristics and lifestyle choices

Advert on website: Slimming World are working with a PhD student from Lincoln University to look into the relationship between self-perceptions and your progress during your time with Slimming World. You are being invited to take part in this study as you joined Slimming World in January 2014 and are therefore still near the beginning of your weight loss journey.

Purpose and Background:

The purpose of this study is to establish if there is a relationship between self-perceptions and progress through your weight loss journey with Slimming World.

What we're asking you to do:

The study involves the completion of an online self-perceptions questionnaire and eating type identity questionnaire, which will take approximately 10 minutes to complete.

We will also match your questionnaire answers to your Xpressweigh data using the information you give us, and then everything will be anonymised so that your data will not be identifiable. You will also be asked to complete the same questionnaire after 3 months, 6 months and 12 months.

A few participants may be contacted by the Lincoln researcher and invited to take part in a focus group to discuss self-perceptions.

Taking part in this study is completely voluntary, will not affect your membership at Slimming World and you are free to withdraw at any time (by closing the browser and ignoring future questionnaires).

By clicking onto the survey you are consenting to taking part in this study.

Expanding from here so they can read everything if they choose

Benefits:

The report written using the results from this survey will not contain reference to any individual data and you will not be identified. The study may aid in identifying whether specific self-perceptions are related to adherence and success at Slimming World. If a relationship is identified it may help Slimming World to improve its service to members. No material rewards are given to you for participation in this research.

Risks:

The only potential risk associated with participation in this project concerns the leakage of personal information. To ensure that this does not occur; the only people who will see your personal information will be the Slimming World research team; data will be stored securely; and no names will be attached to any of the collected data when used by the Lincoln University researcher– meaning that no individual involved in the project will be identified in any publications.

Freedom to withdraw:

You are free to withdraw from the study at any time. Upon such a request, no further data will be collected although any data collect so far may be kept.

Confidentiality:

No names will be attached to collected data given to the university researchers. This coded data will then be analysed by the research team. The research team will only know you as a code number. Data sheets will be stored in a locked cabinet and on a password protected computer to which only the researchers will have access.

Who has reviewed the study?

The study has been reviewed by the School of Sport and Exercise Science, University of Lincoln Research Ethics Committee.

Contact details for further information:

Principal Investigator: Lizzie Stamp, The University of Lincoln, Brayford Pool, Lincoln, LN6 7TS. Tel: 01522 886803. E-mail: estamp@lincoln.ac.uk

Project Supervisor: Lee Crust, The University of Lincoln, Brayford Pool, Lincoln, LN6 7TS. Tel: 01522 886803. E-mail: lcrust@lincoln.ac.uk

If you wish to participate in this study, please click onto the survey and fill it in, and

tick the box to provide consent to participate in this study.

Do you understand that you have been asked to take part in a research study?

Have you received and read a copy of the Information Letter?

Do you understand that you are free to refuse to participate, or to withdraw from the study

at any time, without consequence?

Appendix I: Study Three Participant Recruitment

Appendix J: Study Three Participant Information and Informed Consent

Self-perception Study

Study title: Relationship between individual characteristics and lifestyle choices

Purpose and Background:

The purpose of this study is to establish if there is a relationship between self-perceptions and progress when trying to lose weight.

What we're asking you to do:

The study involves the completion of an online self-perceptions questionnaire and eating type identity questionnaire. Furthermore, some background details will be required. In total the questionnaires will take approximately 10 minutes to complete.

You will also be asked to complete the same questionnaires and record your weight after three months and six months.

A few participants may be contacted by the researcher and invited to take part in a focus group to discuss self-perceptions.

Taking part in this study is completely voluntary. By clicking onto the survey, you are consenting to taking part in this study.

Benefits:

The report written using the results from this survey will not contain reference to any individual data and you will not be identified. The study may aid in identifying whether specific self-perceptions are related to adherence and success in weight loss. No material rewards are given to you for participation in this research.

Risks:

The only potential risk associated with participation in this project concerns the leakage of personal information. To ensure that this does not occur; the only people who will see your personal information will be the research team; data will be stored securely, meaning that no individual involved in the project will be identified in any publications.

Freedom to withdraw:

You are free to withdraw from the study at any time. Upon such a request, no further data will be collected although any data collect so far may be kept.

Confidentiality:

No names will be attached to collected data given to the university researchers. This coded data will then be analysed by the research team. The research team will only know you as a code number. Data sheets will be stored in a locked cabinet and on a password protected computer to which only the researchers will have access.

Who has reviewed the study?

The study has been reviewed by the School of Sport and Exercise Science, University of Lincoln Research Ethics Committee.

Contact details for further information:

Principal Investigator: Lizzie Stamp, The University of Lincoln, Brayford Pool, Lincoln, LN6 7TS. Tel: 01522 886803. E-mail: estamp@lincoln.ac.uk

Project Supervisor: Lee Crust, The University of Lincoln, Brayford Pool, Lincoln, LN6 7TS. Tel: 01522 886803. E-mail: lcrust@lincoln.ac.uk

If you wish to participate in this study, please click onto the survey and fill it in, and tick the box to provide consent to participate in this study.

Do you understand that you have been asked to take part in a research study?

Have you received and read a copy of the Information Letter?

Do you understand that you are free to refuse to participate, or to withdraw from the study

at any time, without consequence?

Appendix K: Study Four Participant Information Sheet and Informed Consent

Participant Information Sheet

Study Title: The role of psychological factors in weight loss progress

You are being invited to take part in a research project. Before you decide to participate it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask if anything is unclear or if you would like more information.

What is the purpose of the study?
The purpose of this study is to identify the role of psychological variables when trying to lose weight.

Why have I been invited?
You have been invited to patriciate in this study as you completed the previous study, assessing weight loss in relation to psychological variable, and provided permission to be contacted regarding further research.

What would be involved for me?
You would be required to participate in an interview lasting approximately one hour to discuss your experiences of pursuing a weight loss goal.

What are the possible benefits of taking part?
The study may aid in identifying whether specific psychological variables are related to adherence and success in weight loss. You will also receive an Amazon voucher as a thank you for your time.

What are the possible disadvantages and risks of participation?
The topic of weight loss may be a sensitive subject for some people. Although the questions do not intend to be personal, if you are uncomfortable with any questions you are free to terminate the interview at any time.

Do I have to take part?
No, you can choose not to participate. You are also free to withdraw from the study at any time. Upon such a request, no further data will be collected although any data collected so far may be kept.

What do I need to do if I wish to take part?
If after reading this form you are happy to take part, please sign the informed consent.

Will my taking part in the study be kept confidential?
Yes, all participants are referred to as a code. If any data is published your data will remain unidentifiable.

What if I have any concerns or queries?

If you have any concerns, please contact one of the researchers: Elizabeth Stamp (estamp@lincoln.ac.uk); Lee Crust (lcrsut@lincoln.ac.uk); Christian Swann (cswann@lincoln.ac.uk).
If you would like to talk to someone about ethical issues relating to the project, please contact Mistrelle Ellmore (mellmore@lincoln.ac.uk; tel 01522 837094) at the University of Lincoln.

Thank you for taking the time to read this information:

Consent Form

I agree to take part in this research project which involves taking part in a 60-minute interview. Any information I provide will remain strictly confidential.

- The full details of the research have been explained to me and I am fully aware of what is expected of me as a participant.
- I am aware that I am not obliged to participate in the interview and that I am able to stop at any point, for any reason.
- I am aware that the research results and any information I have provided are fully confidential and that no reference in any written publication or oral presentation will link me to participation in the study
- I am aware that my participation in this study is completely voluntary. If I decide not to participate there will not be any negative consequences. I am aware that if I decide to participate, I may choose to withdraw at any time and ask that any data collected concerning myself is destroyed.
- I have read and understand the information above, and any questions that I had have been fully answered. I agree to participate in this study.

_____
_____

Name (Print): _____

Signature of Participant: _____

Date: _____

Appendix L: Study Four Interview Schedule

1. How long have you been trying to lose weight for, and adopt a healthier lifestyle, or is this the first time?
    a. Motivation? Enjoyable or chore? Alone with others?

2. Have you set any goals which you wanted to achieve?
        i. Have you achieved them?
        ii. Long term short term
        iii. Flexible rigid
        iv. Objective subjective
        v. Competitive/personal – compare to personal goals or other people?
        vi. Effect of achieve and miss
    b. How committed do you think you have been? Can you give some examples of your high / low levels of commitment to leading a healthier lifestyle?
        i. Why/why not? / What aided/hindered your commitment?
    c. Did you use any strategies, such as create a pre-planned programme, monitor progress, reflecting on behaviour, to help you with weight loss timing of shopping exercise?
    d. Did you have days when you didn't want to be eating healthy food and exercise?
    e. Where did losing weight lie within your priorities?

3. Do you feel like you have been in control of your weight loss journey and made your own decisions?
    a. How have you managed the process of change around other aspects of life – work, child care etc.?
    b. How do you cope if you have an event which will affect your lifestyle?
        i. Prepare and plan
        ii. Compensate
        iii. Just let it be
        iv. Avoid the situation
    c. Unexpected event?
    d. Are there times when you have lost control of the food exercise? Guilt or shame?
    e. Get back on track or is dwelling part of the process?
    f. What do you think it is that makes the final decision on days when you are unsure about what to eat/exercise?
    g. Can you tell me about any emotional aspects involved? For example, were there any triggers which made you lose control or commitment

over what you ate/how much exercise you did? For example, when stressed, happy?

4. Can you describe any of the difficulties you have faced during the weight-loss journey? How did you perceive / think about these at the time?
    a. Have you leant any new skills/taken up new activities? Actively sought, or passive
    b. Inhibitors of weight loss

5. Did you have confidence in the fact you would achieve your weight loss goal and adopt a healthier lifestyle at the start, middle, end?
    a. What influenced confidence?
        i. Reaching goals – rewards, certificates, Other people's comments
    b. How confident are you now about continuing to make progress / maintain the gains in the next six months?

6. Coping processes –
    a. Have you tried to lose weight independently, or did you rely on the help of external sources, knowledge, material, media, or other people? Always or sometimes?
    b. When would you rely on these sources?
    c. Did other people influence your weight loss journey? People you live with, gym staff, apps etc.
    d. If you were receiving support or attending a session to aid weight loss what would you find most beneficial? Facts, figures, research from studies delivered by an expert in the area? Or more anecdotal stories from people who have been through a weight loss journey in similar situations, and through the same experiences, to provide advice?

7. You:
    a. What is the difference between you and someone who lost/gained weight?
    b. In terms of learning from experience, what advice would you give to someone beginning their own weight-loss journey?
    c. Do you think certain psychological characteristics can benefit adherence to losing weight, being physically active, eating healthily?

8. Have you ever heard of the term mental toughness? What is your understanding of the term mental toughness?
    a. Do you think there is a difference in ability to adhere to weight loss plans between high and low mentally tough individuals?

b. From your weight loss journey are there any examples of when you displayed mentally tough/low mentally tough behaviour?
c. Anything else you would like to add?

Appendix M: Study Four Evidence of Transcript – High Mental Toughness

KEY
Bold: Interviewer
Regular: Respondent
[ ]: Uncertain word(s)

Thank you for coming today. Are you happy with everything that was on the information sheet as well?

Yes, thank you.

Okay. And just to check a couple of things as well. Once these have all been transcribed, I'll send it over to you. You can have a look and check you're happy and what you've said is what you've said, if that's okay?

Yes.

If there's anything when I'm reading the transcripts that I'm maybe not too sure about and want to clarify, are you happy for an email just to be sent to you to check?

Yes, of course.

All right, thank you. When I'm talking, I'll refer to your weight loss journey as that time from January when you started the study up until the summer time when you finished. But if you want to draw on other experiences, then you're more than welcome to as well.

Okay.

So, to start with, just a bit of background, general information. You can refer to either your diet or physical activity all the way throughout.

Okay.

How long have you been trying to lose weight and adopt a healthier lifestyle of diet and physical activity for?

Probably around about ten years, mainly because I was - I was diagnosed with Graves disease and celiac disease about ten years ago. Graves disease is something called hyperthyroidism, so at that time I lost a huge amount of weight very rapidly; I went down to about six stone because my thyroid was overactive. And so at that time, I'd be

Participant

Appendix N: Study Four Summary Report - High Mental Toughness Group

Weight Loss Experiences Interviews: Summary Report

In 2014 – 2016 interviews were conducted with people who were trying to lose weight. The interviews explored the experiences of pursuing a weight loss goal, for example, barriers and facilitators of weight loss and coping mechanisms employed. During the interviews a number of people expressed an interest in reading a summary of the preliminary findings. A brief summary of the findings is presented below. These findings represent the majority of the group; however, there are some exceptions to the findings. Please review the findings and let me know if you have any comments, for example if you agree/disagree with the findings. Thank you for taking the time to participate in the interview.

Results showed that:

- A range of factors motivated individuals to lose weight, which included health, appearance, fitness, for sport, and competition with others. During the pursuit of the weight loss goal motivation came from sources such as seeing self-improvement (e.g., weight loss, enhanced fitness), being more successful than others, and self-reflection.
- The value of the weight loss goal appeared to play a role in determining weight loss success. Generally speaking, if the goal of losing weight and changing behaviour was prioritised weight was lost, however if other goals took priority (e.g., career, hobby, family, childcare) the amount of time invested into changing behaviours was reduced and weight loss was less successful.
- Most people did not place a great reliance on social support, however when help was needed or knowledge was required people sought appropriate support. The support came from sources such as slimming clubs, dieticians, personal trainers.
- For most people, when unhealthy food was consumed or an exercise session was missed, they were able to regain focus and control over their lifestyle choices.
- A number of participants went through a process of self -reflection, and identified that causes of a problem/missing a goal. The was then reacted to

accordingly, meaning the cause of the problem was often addressed. A number of participants also reported emotional eating in response to stress and tiredness.

- The majority of the participants perceived the weight loss as a positive challenge that they wanted to achieve. The positive of the behaviour change process was also acknowledged, for example, losing weight, improving at a sport, or learning new cooking skills and trying new foods.
- Confidence was relatively high amongst most of the participants when pursuing their weight loss goal.

I would like to take this opportunity to thank you again for taking part in this doctoral research study. If you have any questions regarding the results or PhD study, please do not hesitate to contact me: estamp@lincoln.ac.uk

Kind regards,

Lizzie Stamp

Appendix O: Study Four Evidence of Transcript – Low Mental Toughness

KEY
Bold: Interviewer
Regular: Respondent
[ ]: Uncertain word(s)

So thank you for agreeing to be interviewed. Was the informed consent okay as well?

Yes, it was fine.

Oh good, thank you. And when we've done the interview and it's typed up, I'll send you a transcript to check that you're happy with everything that you've said and everything's treated confidentially and anonymously. If there's anything after the interview that it would be good to follow up, maybe a further question, are you happy with me just to drop you an email?

Absolutely.

All right, thank you. So just to start off with, really, a bit of background about yourself. How long have you been trying to adopt a healthier lifestyle and lose weight or is when you joined Slimming World the first time?

No I've been trying to lose weight since 2003.

Okay.

Unsuccessfully I might add. (Laughs)

Is this the first time that you've tried Slimming World then?

No, no. I've joined Slimming World twice.

Okay. What were you going to say?

I was going to say that the first time I tried an organised slimming thing, it was a Rosemary Conley one and that lasted about four weeks, and then a few years later I tried Weight Watchers and I lost a stone and then it all started coming back on but I'd not done anything differently and I was honestly not cheating and I though oh, I can't be doing with this. Then I did, several years later, my local authority started the lose weight feel great plans and it was basically – they would pay for 12 weeks of Slimming World with an exercise class each week and I did quite well with that while I was doing it for the 12 weeks but after the 12 weeks, it fell off, well I fell off the wagon.

Group

Appendix P: Study Four Summary Report - Low Mental Toughness Group

Weight Loss Experiences Interviews: Summary Report

In 2014 – 2016 interviews were conducted with people who were trying to lose weight. The interviews explored the experiences of pursuing a weight loss goal, for example, barriers and facilitators of weight loss and coping mechanisms employed. During the interviews a number of people expressed an interest in reading a summary of the preliminary findings. A brief summary of the findings is presented below. These findings represent the majority of the group; however, there are some exceptions to the findings. Please review the findings and let me know if you have any comments, for example if you agree/disagree with the findings. Thank you for taking the time to participate in the interview.

Results showed that:

- The main motivators for weight loss included; enhance appearance, enhance health, enhance fitness to complete daily activities, or were advised by medical professional. Motivation was increased throughout the weight loss journey from sources such as praise and comments from others, achieving goals, gaining a sense of belonging to the environment (e.g. fit in the gym), rewards (e.g., certificates) from support groups.
- A number of people did not set clear goals of how much weight they wanted to lose, or how weight loss was going to be achieved. More general goals such as ‘lose weight’ and ‘get fitter’ were set.
- The majority of participants acknowledged that during the early stages of their weight loss journey they had low levels of control. For example, once one unhealthy food was consumed an unhealthy diet would be continued. Once the plan had gone off track, it could be difficult to regain focus and follow a healthy lifestyle. However, when healthy eating and exercise was going to plan, it provided motivation to remain focused.
- Over time, some people learnt strategies to overcome the lower levels of control around food, for example having pre-prepared snacks (e.g., chopped fruit) readily available so less healthy snacks were not consumed, or only shopping at the supermarket when they were not hungry.

- The prospect of losing weight was initially perceived as a challenge that may be difficult. A number of people had initial low levels of confidence to lose weight.
- Confidence increased in a lot of the participants, for example being more comfortable in the gym. Confidence increased due to achieving a goal, or positive comments from others.
- Most of the group reported seeking support and relying on others to assist their behaviour change to lose weight. Sources of support included, slimming clubs, personal trainers, work colleagues, friends, and family.
- When facing challenges, often the emotional aspects of the problem were addressed, for example how the individual felt, and dealing with emotions. This could to emotional eating.

I would like to take this opportunity to thank you again for taking part in this doctoral research study. If you have any questions regarding the results or PhD study, please do not hesitate to contact me: estamp@lincoln.ac.uk

Kind regards,

Lizzie Stamp

Appendix Q: Photo of a Low Mental Toughness Group Participant

Motivational Ornament

Appendix R: Study Five Participant Information and Informed Consent

Participant Information Sheet

Study Title: The role of psychological factors in weight loss progress

You are being invited to take part in a research project. Before you decide to participate it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask if anything is unclear or if you would like more information.

What is the purpose of the study?
The purpose of this study is to identify the role of psychological variables when trying to lose weight.

Why have I been invited?
You have been invited to participate in this study as you have a desire to lose weight, and have attempted to lose weight in the past.

What would be involved for me?
You would be required to participate in an interview between yourself and the researcher. You can select to be interviewed either face to face, via skype, or via telephone. The interview will last approximately 30 minutes. The interview involves you being presented with hypothetical scenarios in relation to weight loss. You will be asked how you would respond if you were placed in these situations.

What are the possible benefits of taking part?
The study may aid in identifying whether specific psychological variables are related to adherence and success in weight loss. There is an Amazon voucher reward as a thank you for participating in this study.

What are the possible disadvantages and risks of participation?
The topic of weight loss may be a sensitive subject for some people. Although the questions do not intend to be personal, if you are uncomfortable with any questions you are free to terminate the interview at any time.

Do I have to take part?
No, you can choose not to participate. You are also free to withdraw from the study at any time. Upon such a request, no further data will be collected although any data collected so far may be kept.

What do I need to do if I wish to take part?
If after reading this form you are happy to take part, please sign the informed consent form.

Will my taking part in the study be kept confidential?
Yes, all participants are referred to as a code. If any data is published your data will remain unidentifiable.

What if I have any concerns or queries?
If you have any concerns please contact one of the researchers: Elizabeth Stamp (estamp@lincoln.ac.uk); Lee Crust (lcrsut@lincoln.ac.uk); Christian Swann (cswann@uow.edu.au).

If you would like to talk to someone about ethical issues relating to the project, please contact Danny Taylor (**dtaylor@lincoln.ac.uk**; (tel: 01522 837094) at the University of Lincoln.

Thank you for taking the time to read this information:

Consent Form

I agree to take part in this research project which involves taking part in a 30-minute interview. Any information I provide will remain **strictly confidential**.

- The full details of the research have been explained to me and I am fully aware of what is expected of me as a participant.

- I am aware that I am not obliged to complete the interview and that I am able to stop at any point, for any reason.

- I am aware that the research results and any information I have provided are fully confidential and that no reference in any written publication or oral presentation will link me to participation in the study.

- I am aware that my participation in this study is completely voluntary. If I decide not to participate there will not be any negative consequences. I am aware that if I decide to participate, I may choose to withdraw at any time and ask that any data collected concerning myself is destroyed.

- I have read and understand the information above, and any questions that I had have been fully answered. I agree to participate in this study.

_____
_____

Name (Print): _____

Signature of Participant: _____

Date: _____

Appendix S: Study Five Interview schedule

Thank you for taking the time to come and be interviewed today. The aim of the chat today is to discuss some hypothetical situations which you may have encountered yourself. There are three scenarios which follow on from each other with the same character throughout. The character is Sam who has wanted to lose weight. You can use past experiences and your expectations, to answer the questions which follow.

Is that clear? Would you like any further clarification?

Scenario 1

Sam has been offered the opportunity to go to a 12-week weight loss programme and was provided the choice of two. Option 1 is run by experts who provide information and theories of how to lose weight through diet and exercise. Option 2 is run by people who have been through a similar situation of wanting to lose weight, and will discuss the difficulties they had, how they overcome them, and offer tips from their experiences for losing weight.

Which option would Sam pick and why?

Why would the other option not work?

Where will the support come from throughout the weight loss journey? (e.g., the 12-week programme leaders, family, friends) the any significant people?

How would Sam view the process of losing weight - a threat which will be difficult, or a challenge that offers the opportunity to learn new skills and develop?

Scenario 2

Sam has continued following the weight loss programme for a few years and has managed to lose weight despite some setbacks. Sam has remained on track and focused for the last couple of weeks, eating healthily and exercising. When Sam got to work in the morning it was announced it would be a working lunchtime meeting with a buffet provided. Sam had planned to eat a packed lunch with foods which were suitable for the diet. As well as diet, potentially being affected, Sam will also miss the lunchtime gym workout with a friend.

How would Sam feel in this situation? How would Sam react?

Will Sam eat the buffet?

Will this have an effect on the rest of Sam's day?

Will this effect subsequent days?

If there had been advanced notice would this have affected Sam's choices?

Will the friends still go to work out?

Scenario 3

Sam has been following the diet and exercise plan. However, after a stressful day at work Sam did not finish until 6.30, as opposed to the usual 5pm finish. Sam is feeling tired and stressed. Initially Sam had planned on cooking a healthy meal. Sam's journey home passes a number of takeaways.

What will Sam do? – eat the takeaway or cook – why?

How would Sam feel when eating it?

What if Sam chose the other option how feel?

Appendix T: Study Five Evidence of Transcript

KEY
Bold: Interviewer
Regular: Respondent
[ ]: Uncertain word(s)

Okay, so thank you for taking the time to talk today, I will outline the study and if you have got any questions you can ask. It's a little bit different to last time we talked. Before we start, were you happy with the informed consent and everything on it?

Yes, yeah.

Yeah, okay, thank you for returning that as well. So today, it's a bit different, last time we talked and it involved me asking questions about the weight loss journey you had, this time the aim of the chat is to discuss some hypothetical situations. So you may have encountered these yourself or you may have encountered similar situations like this. There are three scenarios which follow on from each other with the same character throughout them and the character is Sam who wanted to lose weight and you can use your past experiences or your expectations to answer the questions on how you think the character will ask, so how Sam will respond. Does that make sense?

Yeah.

Yeah, as we go through it, it will probably make more sense. So the first scenario, it's a bit long so I can repeat anything if you have forgotten any of it, so basically Sam has been offered the opportunity to go on a 12 week weight loss programme and was provided with a choice of two. Option one was run by experts who provide information and theories on how to lose weight through diet and exercise. Number two is run by people who have been through a similar situation wanting to lose weight, discuss the difficulties, how they overcame then and provide some advice from their own experience. Which option do you think Sam would pick, which one do you want to have Sam picking?

From my own experience, I would pick two.

Okay and why would you go for that one?

My son has just come in and asked me to move, sorry.

I can hear you better actually now it's moved.

Appendix U: Study Five Summary Report

Weight Loss Experiences Interviews: Summary Report

In 2016 interviews were conducted with people who were trying to lose weight. The interviews consisted of hypothetical scenarios in which a character called Sam, who was trying to lose weight, was discussed. The interviews explored how Sam would react in a given situation that influenced lifestyle behaviours and weight loss progress. During the interviews a number of people expressed an interest in reading a summary of the preliminary findings. A brief summary of the findings is presented below. These findings represent the majority of the group; however, there are some exceptions to the findings. Please review the findings and let me know if you have any comments, for example if you agree/disagree with the findings. Thank you for taking the time to participate in the interview.

Results are summarised in terms of how participants expected Sam to act. The results showed that:

- Most participants expected Sam to rely on social support from others. In addition, the benefits of providing social support to others were also acknowledged as it can make one feel more valued and worthwhile. Furthermore, a lot of participants expected Sam's friend would probably not attend a gym work out if Sam could not go to.
- There were mixed reviews as to whether Sam would consume an unexpected lunchtime buffet at work. For most of those who suggested that Sam would consume the packed lunch as initially intended, Sam was expected to make excuses to account for being different to the rest of the colleagues eating the buffet. For the majority of people who proposed Sam would eat the buffest, they suggested it helped Sam fit in or Sam would just accept the buffer was eaten.
- A number of participants perceived that choosing healthy behaviours as a lot of effort. For example, when discussing if Sam would consume a healthy meal or a takeaway after a stressful day at work, some participants suggested that cooking the meal would be an effort and a struggle. Most participants selected the takeaway option, as they felt Sam needed to be made happy and deserved it.

- A lot of participants expected Sam to initially perceive the weight loss journey as a difficult time. When scenarios that discussed Sam being a couple of years into the weight loss journey were discussed, Sam was expected to have learnt coping mechanisms to deal with unexpected events and going off track.
- Some participants discussed that external factors influencing behaviours could have a positive effect, as they restrict one from selecting less healthy options. For example, being ill or not being able to eat certain foods for medical reasons.

I would like to take this opportunity to thank you again for taking part in this doctoral research study. If you have any questions regarding the results or PhD study, please do not hesitate to contact me: estamp@lincoln.ac.uk

Kind regards,

Lizzie Stamp

Appendix V: Published Paper from Study One – Mental Toughness and Psychological Wellbeing in Personality and Individual Differences

Running head: Mental toughness and psychological wellbeing

Title: Relationships between mental toughness and psychological wellbeing in undergraduate University students

Elizabeth Stamp, Lee Crust, Christian Swann, John Perry, Peter Clough and David Marchant.

Elizabeth Stamp, Lee Crust, and Christian Swann are with the School of Sport and Exercise Science, The University of Lincoln, Brayford Pool, Lincoln, Lincolnshire, LN6 7TS. John Perry is with the School of Sport, Health, and Nutrition, Leeds Trinity University, Brownberrie Lane, Horsforth, Leeds, LS18 5HD. Peter Clough is with the Department of Psychology, Manchester Metropolitan University, Elizabeth Gaskell Campus, Hathersage Road, Manchester, M13 0JA. David Marchant is with the Department of Sport and Physical Activity, Edge Hill University, St Helens Road, Ormskirk, L39 4QP.

Keywords:

Manuscript Type: Original Research

Introduction

In that last decade, numerous studies have raised concerns about the mental health of university students (Bray & Born, 2004; Hunt & Eisenberg, 2010). In particular, the transition from further to higher education is a process characterised by ambiguity and changing academic, social and emotional demands that require psychological adjustment (Gall, Evans, & Bellerose, 2000; Pritchard, Wilson, & Yamnitz, 2007). Wynaden, Wichmann, and Murray (2013) identified university students as being a particular 'at risk' population because the typical age at which most young adults enter higher education, also coincides with the age of onset of numerous psychological disorders (i.e. anxiety, depression) and substance abuse. In the United Kingdom (UK) government policies to encourage a wider range of young people to attend university, alongside concurrent reductions in financial support for students (thus increasing worry about financial debt) have prompted predictions of increased mental health problems in the student population (UK Royal College of Psychiatrics, 2011). Recent statistics identified UK university students to have similar levels of mental illness and disturbance to that of the general population but were less likely to seek treatment (Macaskill, 2013). Among other things, mental health problems in students have been found to be associated with poor academic performance, increased rates of attrition (i.e. programme drop-out), fewer days devoted to study, suicidal thoughts and disordered eating (Duane, Stewart, & Bridgeland, 2003; Kugu, Akyuz, Dogan, Ersan, & Izgic, 2006; Stallman, 2008).

Many studies that have examined mental health within university students have utilised measures of illness, disturbance or distress. Despite this, the seminal work of Seligman and Csikszentmihayli (2000) identifies psychological health as not simply the absence of illness, but represents positive human functioning and

flourishing. In this regard, it is important to understand both the correlates of mental illness and to identify predictors of psychological wellbeing and optimal functioning.

Psychological Wellbeing

Psychological wellbeing represents "the achievement of one's full psychological potential" (Carr, 2004, p. 36). While different opinions still exist concerning the exact conceptualisation of psychological wellbeing, it is generally agreed to be a multidimensional construct. The work of Ryff and colleagues provides perhaps the most accepted and theory-driven approach to the study of psychological wellbeing. Ryff (1989) identified six distinct components that represent the six-factor model of psychological wellbeing. The breadth of wellbeing identified by Ryff comprises of (1) self-acceptance (positive evaluations of oneself and one's past life), (2) personal growth (sense of development and continued growth as an individual), (3) purpose in life (belief that one's life is meaningful), (4) positive relations with others (existence of meaningful relationships with others), (5) environmental mastery (capacity to effectively manage one's life and the surrounding world), and (6) autonomy (a sense of self-determination). Alongside this model, Ryff developed a measurement instrument, the Scales of Psychological Wellbeing (SPWB), which has been subjected to psychometric analyses using both exploratory and confirmatory factor analysis, which supported the existence of six distinct components of psychological wellbeing (Ryff & Keyes, 1995).

Much research has evaluated mental health in first-year university students and in particular during the transition from further to higher education. First-year transition is typically reported as a stressful time for many students who face the challenges of independent living (being away from home for the first time, managing personal finances), developing new friendships / support systems, and adjusting to

new learning regimes (Scanlon, Rowling, & Weber, 2010). Recent research, however, highlights that this is not the only period of concern. For example, a study of 1197 students from a UK university (Macaskill, 2013) found highest levels of psychiatric symptoms in second-year students. It was argued that while UK universities have targeted additional support for first-year students to enable a smoother transition to university life (Nelson, Quinn, Marrington, & Clarke, 2013), that the second year of study comprises a different set of potential stressors. For example, second year students typically have to move out of university accommodation (first year students being the priority) and face adjusting to life with new housemates, which can create tensions. Second year study often involves new support tutors, optional modules and seminar groups that can separate students from their friends, and for many universities, second year grades begin to contribute towards final degree classification, adding additional pressure to perform well. These pressures continue into the third year of study as students undertake their final assessments, dissertation work, and eventually begin to plan for post-graduate study or employment. Thus, students across all years of study have to cope with emerging challenges.

While some students experience psychological disturbance during time at university, many others cope effectively and some thrive amidst the challenges. Whether someone becomes mentally ill or functions optimally when faced with challenging circumstances is likely due to complex interactions between genetic, biological, social, and cultural factors. Various models of stress (see Ingram & Luxon, 2005) predict susceptibility is influenced by underlying vulnerabilities, although protective factors can modify responses to stress. For example, numerous studies (Costa, Somerfield, & McCrae, 1996; Kobasa et al., 1982) have found that

personality and concomitant individual differences in coping can function as resistance resources that help buffer the potentially harmful effects of stress. One such individual difference that has emerged from sports research as important during confrontations with stress is mental toughness (MT).

Mental Toughness

Gucciardi, Gordon, and Dimmock (2009) propose that MT is a collection of experientially developed and inherent values, attitudes, emotions, and cognitions that influence the way in which an individual approaches, responds to, and appraises both negatively and positively construed pressure, challenge, and adversity to consistently achieve his or her goals. Conceptual arguments exist concerning the extent to which MT is inherited and relatively stable (Clough & Strycharczyk, 2012; Horsburgh et al., 2009) as opposed to being socialised or taught via more formal psychological skills training (Gordon, 2012). While the theoretical debate continues, both qualitative and quantitative studies have found MT to be somewhat amenable to development through targeted interventions (Gordon, 2012; Gucciardi *et al.*, 2009b).

While various models of MT have been presented (e.g. Gucciardi *et al*., 2009a; Jones *et al*., 2007) perhaps the most parsimonious and theory driven account of the construct (cf. Weinberg & Gould, 2007) was provided by Clough, Earle, and Sewell (2002). Clough and colleagues proposed that MT is represented by: (1) control (emotional and life), which reflects a tendency to feel and act as if one is influential, (2) commitment, which concerns deep involvement with whatever one is doing, in contrast to alienation, (3) challenge, refers to the extent to which individuals see problems as opportunities for self-development rather than threats, and (4) confidence (in abilities and interpersonal), reflecting a high sense of self belief and an unshakeable faith in having the ability to achieve success while not

being intimidated in dealings with other people. Alongside this model, Clough et al. developed a measure of MT (Mental Toughness Questionnaire-48; MTQ48) that has been extensively used and tested by researchers (see Perry, Clough, Crust, Earle, & Nicholls, 2013). Using the measure and model of Clough et al., researchers have begun to expand the study of MT to encompass business, health, and educational settings (see Clough & Strycharczyk, 2012). In one recent study, Crust, Earle, Perry, Earle, Clough and Clough (2014) found MT significantly related to academic achievement and progression in 161 first-year university students. In particular, life control and interpersonal confidence were significant predictors of end of year grade. Students with lower levels of MT were more likely to withdraw from their programme in the first year, and as such it is likely that MT helps students to cope with challenges associated with transition into higher education.

Theoretically, there are a number of reasons to predict that mental toughness will be related to student wellbeing in higher education. According to Wilson and Pritchard (2005) the cumulative effects of multiple stressors can negatively impact on student wellbeing. While the learning environment and support mechanisms are external factors that can aid transition and coping (Nelson, Kift, Humphreys, & Harper, 2006), individual resources will also contribute significantly to this process. MT is associated with more effective coping skills (Nicholls et al., 2011), optimistic appraisals (Nicholls, Polman, Levy, & Backhouse, 2008) and high levels of self-esteem (Clough et al., 2002). Pritchard, Wilson, and Yamnitz (2007) have shown optimism and self-esteem in particular, to be positively related to effective student transitions.

The ability to cope with change and the simultaneous demands that occur during transitions, and to see this process as a challenge rather than a threat is

indicative of mentally tough individuals who persist during adverse or difficult circumstances (Gucciardi et al., 2009a). As such, we predict a significant and positive relationship between mental toughness and psychological wellbeing within university students. One final reason to expect mental toughness to be related to wellbeing concerns the important characteristics of independence and responsibility. Various researchers have reported mentally tough athletes to be independent, able to solve their own problems, and to take responsibility for their own development (Bull et al., 2005; Cook, Crust, Littlewood, Nesti, & Allen-Collinson, 2014; Crust & Clough, 2011). These same attributes appear highly valued in higher education (Cottrell, 2008), reflect the objectives of most institutions (creation of independent learners), and being autonomous rather than controlled is one of the key components of psychological wellbeing.

The main aim of this study is to evaluate the relationship between MT and psychological wellbeing in university students. The existence of a relationship could have two important applied implications for future research: namely the potential for MT as a screening device to identify students who may need support to manage the demands of higher education, and the development of targeted interventions to support such students and enhance wellbeing.

Method

Participants

The sample consisted of 168 undergraduate university students (44 male and 124 female) who were studying at eight universities in the United Kingdom. Participants age ranged from 18 to 40 years (M = 20.83 years ± 3.4 years). The sample involved 63 first-year students, 44 second-year students and 61 third-year students. Most of the sample was white British with approximately five

per cent from black and ethnic minority groups including Pakistani, Zimbabwean, Polish and Nigerian. The majority of students were studying Sport or Psychology related courses, although a broad range of other courses were represented including mechanical engineering, aquatic zoology and fashion design. The questionnaires were distributed at eight UK universities.

Instruments

The Scales of Psychological Wellbeing (SPWB; Ryff, 1989) questionnaire was used to measure psychological wellbeing. While different length versions are available, in this study the 54-item version was employed, meaning each of the six scales of wellbeing was assessed via nine items. Questionnaire completion took approximately 10 min. Participants responded using a six-point format with verbal anchors ranging from (1) *strongly disagree* to (6) *strongly agree,* with some items reverse scored. This instrument measures (1) self-acceptance, (2) personal growth, (3) purpose in life, (4) positive relations with others, (5) environmental mastery, and (6) autonomy. While there is evidence of acceptable internal consistency and test-retest reliability (Ryff, 1989) this has not been the case in all studies (Van Dierendonck, 2004). Although a number of psychometric analyses have led to questions over the existence of a six-factor model due to excessive overlap between scales (cf. Abbott et al., 2006; Springer, Hauser, & Freese, 2006), Ryff and Keyes (1995) originally argued that although some high inter-correlations existed, difference across age profiles suggested distinctiveness. In defence of the six-factor model, Ryff and Singer (2006) provided evidence from five categories of studies (i.e., factorial validity, psychological correlates, sociodemographic correlates, biological correlates, and intervention studies) that supported the distinctiveness of the six dimensions of wellbeing.

The Mental Toughness Questionnaire (MTQ48; Clough et al., 2002) was used to measure MT. This 48-item inventory requires responses to statements on a 5-point Likert scale ranging from (1) strongly disagree, to (5) strongly agree, and has an average completion time of around 10 minutes. Example items include "I don't usually give up under pressure", and "I can usually adapt myself to challenges that come my way." Scores for overall MT and for six-subscales can be calculated. The MTQ48 has been extensively used to measure MT and has generally been found to have good reliability, as well as demonstrating construct and criterion validity (Clough et al.; Crust & Clough, 2005; Perry et al., 2013). Independent support for the factor structure of the MTQ48 has been found using confirmatory factor analysis (Horsburgh, Schermer, Veselka, & Vernon, 2009). A recent large scale evaluation of the MTQ48 supported the model and measure although the reliability of one of the subscales (emotional control) was found to be inadequate (Perry, et al., 2013). As such, while emotional control remains an important conceptual component of MT, these authors recommend caution in interpreting findings from this subscale.

Procedure

Lecturers known to members of the research team, and who worked in a variety of different subject areas, were contacted at five UK universities. Initial contact was made via email to outline the nature and importance of the present study with a link provided to the online questionnaire. Information concerning the study was then posted to internal student forums and sent via email lists to students within Schools / Departments where the lecturers worked. Links to the questionnaire were distributed to ensure all students had an equal opportunity to participate. Potential participants were provided with a brief outline of the study, informed about how data was to be used, and either chose to participate or ignored the e-mail. Students

wishing to participate then proceeded to follow an online link to complete an informed consent form. Staff who were initially contacted to distribute information about the study also recommended academics at other institutions who would be willing to become involved resulting in a form of snowball sampling that gained a wider range of students from an addition three UK universities (thus eight universities in total). An anonymous online questionnaire was selected due to significantly decreased social desirability and social anxiety associated over a non-anonymous paper version (Joinson, 1999). Questionnaire completion was self-paced and was followed by an online written debrief. Ethical approval was received from a University ethics committee.

Data Analysis

Data was initially screened for missing data and outliers. Kurtosis, skewness, mean and standard deviation of variables were calculated before proceeding with statistical data analysis. Cronbach alpha scores identified the internal consistency of the validated questionnaires. This was particularly important for the MTQ48, due to the previously discussed suggestion to assess the internal consistency of subscales before continuing with data analysis (Perry et al., 2013). Pearson Product Moment Correlations were conducted to identify the relationship between mental toughness and the lifestyle behaviour and psychological wellbeing of the students. To control for demographic effects, hierarchical multiple linear regression was used to assess examine the predictive capacity of mental toughness on wellbeing.

Results

The data contained no missing data and examination of Q-Q plots revealed no troublesome outliers. Test of univariate normality revealed no departure from skewness (< 2) or kurtosis (< 2). Descriptive statistics are presented in Table 1.

Means for psychological wellbeing appear similar (although slightly lower) to data reported by Ryff (1989) for young adults. Mental toughness subscales presented good internal consistency (i.e., $\alpha > .70$) with the exception of control emotion ($\alpha = .46$) and control life ($\alpha = .69$). The internal consistency of life control was deemed to be at the lower end of acceptability. To investigate the emotional control subscale further, the interitem correlation matrix was examined. Items 26 and 34 presented some negative correlations. These two items were previously identified by Perry et al. (2013) as weak and were therefore removed. The five retained items generated a Cronbach's alpha of .58. This was used as a measure of emotional control in all proceeding analyses. All psychological wellbeing scales presented good internal consistency (Table 1).

Pearson's bivariate correlations were examined to identify relationships among all variables. Notably, every relationship in the matrix was statistically significant. All components of mental toughness were positively associated with all components of psychological wellbeing. The strongest relationships existed between confidence in abilities and self-acceptance ($r = .77$, $p < .01$), commitment and environmental mastery ($r = .70$, $p < .01$), life control and environmental mastery ($r = .67$, $p < .01$), and confidence in abilities and environmental mastery ($r = .66$, $p < .01$). All correlations are presented in Table 1. Very high correlations can be an indication of redundancy (Kline, 2005). The moderate to moderately-high correlations between psychological wellbeing scales supports the relative independence of each scale.

To further explore the relationships between mental toughness and psychological wellbeing variables, we conducted a series of hierarchical multiple linear regression analyses. In each analyses, age, gender, and year of study were

entered at step one using the enter method. At step two, the six mental toughness variables were entered. Each aspect of wellbeing acted as the dependent variable in separate analyses. Overall, the results indicated that much of the variance for each wellbeing scale was explained by one or more component of mental toughness. In total, the variance explained of each wellbeing scale ranged from 35 to 64%. Specifically, autonomy was positively predicted by commitment ($\beta = .22$, $p < .01$) and interpersonal confidence ($\beta = .51$, $p < .001$). Environmental mastery was positively predicted by commitment ($\beta = .42$, $p < .001$) and confidence in abilities ($\beta = .27$, $p < .01$). Personal growth was positively predicted by challenge ($\beta = .34$, $p < .001$) and commitment ($\beta = .30$, $p < .01$). Positive relations were positively predicted by confidence in abilities ($\beta = .47$, $p < .001$). Purpose in life was positively predicted by commitment ($\beta = .47$, $p < .001$) and life control ($\beta = .29$, $p < .01$) and self-acceptance was positively predicted by confidence in abilities ($\beta = .65$, $p < .001$).

Discussion

The main aim of the present study was to evaluate the relationship between MT and psychological wellbeing in a broad range of undergraduate university students. Consistent with predictions, psychological wellbeing was significantly and positively related to MT. In particular, components of MT were found to be moderate to strong predictors of psychological wellbeing. In contrast age, gender and year of study did not predict psychological wellbeing. Present findings, alongside other recent work (Crust et al., 2014), highlights the importance of MT in higher education. In addition, there is now considerable evidence MT is an important resistance resource in several life domains relating to performance outcomes (i.e. success) and mental health / positive psychological functioning (Clough & Strycharczyk, 2012). Given the pressures and challenges facing contemporary undergraduate students, and the

levels of psychological disturbance in university students previously reported, understanding more about how personal resources can offer protection against ill health and enable students to flourish is timely. Importantly, the present study has used a measure of psychological wellbeing rather than assuming that wellbeing simply reflects the absence of illness. Moreover, the results of the present study identify which particular components of MT predict each of the six scales of psychological wellbeing. As such, the results may allow for more targeted interventions in order to enhance psychological wellbeing.

Commitment was found to be the strongest predictor of both environmental mastery and purpose in life. Theoretically this makes sense as managing the multiple and complex demands of student life (cf. Wilson & Pritchard, 2005; Wynaden, 2013) likely require deep engagement and persistence. Likewise, living a meaningful life and retaining a sense of purpose and direction is reflective of being deeply involved and committed to what one is doing (Kobasa et al., 1982). Confidence in abilities was the strongest predictor of both positive relations with others and self-acceptance. With self-acceptance reflecting positive evaluations of the self and of one's past life (Ryff & Keyes, 1995) the relationship with confidence in abilities is in line with self-efficacy theory (Bandura, 1977) and in particular the most consistent source of reported efficacy, past accomplishments. Furthermore, Clough and Strycharczyk (2012) reported high confidence in abilities reflected optimism and personal perceptions of worthiness. Intuitively it may have been expected that interpersonal confidence would be the strongest predictor of positive relations with others as it reflects the confidence to interact with and not be intimidated by others. Nevertheless, high interpersonal confidence was found to predict autonomy and not positive relations with others (perhaps because high interpersonal confidence can

lead to over-assertiveness). Given that autonomy concerns self-determination, independence and an ability to resist social pressures (Ryff & Keyes, 1995) the relationship with interpersonal confidence is consistent with theoretical expectations. Finally, the relationship between personal growth and challenge is grounded in psychological theory (Kobasa et al, 1982) and reflects challenge seekers approaching rather than avoiding difficult situations, liking competition and problem solving (Clough & Strycharczyk, 2012) and thus achieving personal growth through learning by many varied experiences. The only component of MT not found to significantly predict psychology wellbeing was emotional control and that in part is likely due to problems with the reliability of the scale (see Perry et al., 2013).

From a more applied perspective the importance of MT to psychological wellbeing and success in university students is evident. For example, amongst other things, high levels of MT are related to a willingness to question, respond positively to critical feedback, assert oneself in group settings, see competence in others as a source of motivation, approach challenges as an opportunity to learn and develop, prioritise effectively, expend high amounts of effort, manage time effectively and remain calm when under pressure (Clough & Strycharczyk, 2012). Whilst these appear to be feasible explanations of the purported relationships, it is worth noting that low levels of MT are therefore related to lower psychological wellbeing. That is, students with lower MT are likely to be less resilient to the demands of higher education. As others have highlighted (Crust et al., 2014) the MTQ48 might be an important screening device in the identification of "at risk" students who may not have the necessary personal resources to succeed at university. This may be more reflective of dealing with the challenges of higher education rather than any lack of academic ability. As such, future researchers might profitably examine the impact of

interventions for students with low levels of MT to determine the impact upon success and psychological wellbeing. The relationship reported in the present study and past work (Crust et al., 2014) suggests that interventions targeted at developing MT could impact upon both academic success and psychological wellbeing. Whilst the effects of MT interventions have not been widely studied there are some theoretical underpinnings (Crust & Clough, 2011; Gordon, 2012) and empirical work (Gucciardi et al., 2009) that could be used to adapt interventions from sport for higher education contexts.

One of the strengths of the present study was that participants were obtained from several different universities across a wide range of subjects and across all years of undergraduate study. Nevertheless, several limitations are acknowledged. First, while the use of online data collection has several strengths, there is less control over the actual completion of questions (i.e. alone or with others present) which may have impacted upon some responses. Second, as with all questionnaires there is the potential for socially desirable responding. Finally, only a small number of those students invited to participate actually did and there was evidence of a greater response rate for women than men. Nevertheless, gender was not found to be a significant predictor in this study.

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Table 1

Descriptive Statistics, Normality Estimates, Internal Consistency Coefficients, and Bivariate Correlations

	M (SD)	Skew	Kurt	1	2	3	4	5	6	7	8	9	10	11	12
1. Challenge	3.53 (.56)	-.48	.44	(.72)											
2. Commitment	3.48 (.58)	-.51	.57	.55**	(.80)										
3. Control emotion	2.86 (.70)	-.06	-.40	.60**	.42**	(.58)									
4. Control life	3.45 (.57)	-.77	1.63	.49**	.63**	.46**	(.69)								
5. Conf. ability	3.13 (.70)	-.43	.01	.55**	.56**	.64**	.69**	(.84)							
6. Conf. inter.	3.52 (.74)	-.44	-.04	.41**	.31*	.38**	.38**	.39**	(.76)						
7. Autonomy	36.80 (6.77)	-.37	.27	.37**	.44**	.38**	.42**	.45**	.63**	(.75)					
8. Env. mastery	37.82 (6.95)	-.74	.91	.48**	.70**	.47**	.67**	.66**	.31**	.36**	(.77)				
9. Pers. growth	42.71 (6.45)	-.79	.50	.50**	.52**	.28**	.40**	.43**	.17*	.34**	.51**	(.78)			
10. Pos. relations	40.09 (7.99)	-.72	.28	.32**	.38**	.29**	.43**	.53**	.32**	.22**	.60**	.49**	(.81)		
11. Purpose in life	40.99 (6.78)	-.71	.72	.36**	.64**	.18*	.57**	.44**	.20**	.29**	.70**	.61**	.42**	(.78)	
12. Self-acceptance	37.05 (8.42)	-.64	.17	.47**	.56**	.46**	.62**	.77**	.36**	.46**	.69**	.51**	.63**	.55**	(.85)

*Statistically significant at $p < .05$, **$p < .01$.

Table 2.

Hierarchical Multiple Linear Regression Analyses

Variable	Step 1 Age, Gender, Year of Study	Step 2 Mental Toughness variables
Autonomy	ΔR^2 = .02, F (3, 164) = 1.13 Age β = -.02, Gen β = -.14, YoS β = .07	ΔR^2 = .46***, F (9, 158) = 15.96*** Chl β = -.05, Com β = .22**, Emo β = .03, Life β = .00, Abl β = .14, Int β = .51***
Env. Mastery	ΔR^2 = .00, F (3, 164) = .17 Age β = -.06, Gen β = -.01, YoS β = .01	ΔR^2 = .62***, F (9, 158) = 29.23*** Chl β = -.02, Com β = .42***, Emo β = .06, Life β = .19*, Abl β = .27**, Int β = -.01
Personal Growth	ΔR^2 = .02, F (3, 164) = .90 Age β = .07, Gen β = .00, YoS β = .09	ΔR^2 = .35***, F (9, 158) = 9.97*** Chl β = .34***, Com β = .30**, Emo β = -.15, Life β = .02, Abl β = .19, Int β = -.09
Positive Relations	ΔR^2 = .03, F (3, 164) = 1.69 Age β = -.15, Gen β = .08, YoS β = .05	ΔR^2 = .32***, F (9, 158) = 9.42*** Chl β = .00, Com β = .11, Emo β = -.05, Life β = -.01, Abl β = .47***, Int β = .15
Purpose in Life	ΔR^2 = .01, F (3, 164) = .43 Age β = -.06, Gen β = .01, YoS β = .09	ΔR^2 = .48***, F (9, 158) = 16.82*** Chl β = .05, Com β = .47***, Emo β = -.26*, Life β = .29**, Abl β = .12, Int β = -.03
Self-Acceptance	ΔR^2 = .02, F (3, 164) = 1.04 Age β = -.06, Gen β = -.03, YoS β = .15	ΔR^2 = .62***, F (9, 158) = 30.76*** Chl β = .01, Com β = .15*, Emo β = -.05, Life β = .07, Abl β = .65***, Int β = .05

Note. Gen = Gender, YoS = Year of Study, Chl = Challenge, Com = Commitment, Emo = Emotional Control, Life = Life Control, Abl = Confidence in Abilities, Int = Interpersonal Confidence.
*Statistically significant at $p < .05$, **$p < .01$, ***$p < .001$.

Appendix W: Published Paper from Study One – Mental Toughness and Exercise Barriers in International Journal of Sport Science

Running head: Mental Toughness and Barriers to Exercise

Title: Relationships between mental toughness, barriers to exercise, and exercise behaviour in undergraduate students

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Abstract

The present study explored relationships between mental toughness (MT), barriers to exercise, and self-reported exercise behaviour in university students. Perceived barriers to exercise are important since previous work has identified barriers as strong predictors of exercise behaviour. MT was hypothesised to predict exercise barriers and self-reported exercise behaviour. Participants were 173 undergraduate students (45 men, 128 women) from 10 United Kingdom universities. Questionnaires were used to assess MT, exercise levels, and exercise barriers. Path analysis identified that MT predicted barriers to exercise, with higher MT associated with weaker perceived barriers. Regular exercisers were found to have significantly higher MT than non-regular exercisers, with commitment identified as a key difference. These findings support the proposed hypotheses and provide further evidence of the importance of MT in exercise / physical activity contexts. Future research that adopts longitudinal designs and tests targeted interventions to reduce perceptions of barriers and enhance exercise participation are encouraged.

Keywords: Exercise, exercise barriers, higher education, individual differences, physical activity.

1.0 Introduction

Inactive lifestyle is one of the most serious threats to public health in the United Kingdom (UK) and across the western world (Lee et al., 2012; Townsend, Wickramasinghe, Williams, Bhatnagar & Rayner, 2015). Physical inactivity has been consistently associated with higher levels of obesity and increased risk of developing preventable chronic illnesses such as cardiovascular disease, diabetes, and osteoporosis (Lee et al., 2012). Despite the known physiological (e.g., cardiovascular, respiratory function) and psychological (e.g., wellbeing, mood) benefits of regular and frequent physical activity (PA) / exercise[11], it is evident that knowledge alone is not enough to facilitate the adoption and maintenance of active lifestyles (Buckworth, Dishman, O'Conner & Tomporowski, 2013). PA behaviour change and maintenance has proven complex and challenging and is influenced by numerous psychosocial, economic, environmental, and personal factors. For example, levels of PA in the UK and elsewhere have generally been found to decline when young people attend university (Bray & Born, 2004; Daskapan, Tuzun & Eker, 2006; Lovell, Ansari & Parker, 2010). Time at university signifies an important transition period into adulthood that represents an opportunity to influence PA behaviours (Lovell et al., 2010). One study found almost a quarter of students gained significant weight during the first semester of study (Wengreen & Moncur, 2009). This trend is concerning given that habits formed during early adulthood may impact upon life-long PA behaviour, with evidence that patterns of PA can remain relatively stable up to five years post-graduation (Sparling & Snow, 2002).

[11] While the term 'exercise' is used throughout, we situate this within the broader conceptualisation of physical activity as a lifestyle behaviour of which exercise is a subcomponent.

Numerous theoretical approaches have been developed and applied to understand health behaviours in general and PA in particular. One important framework is the Health Belief Model (HBM). The HBM predicts that the likelihood of engaging in preventative health behaviours such as PA is a function of the perceived threat (inactivity in this case) and the relative costs (e.g., barriers, difficulties, hindrances), as opposed to benefits of adopting a new behaviour. Despite this prediction, evidence has identified a greater number of perceived PA barriers to be associated with lower levels of PA (Ross & Melzer, 2015). Much research has focused upon identifying the correlates of PA and, in particular, understanding the perceived barriers that predict low adoption and dropout, as an important prerequisite for designing and implementing interventions for change (Buckworth et al., 2013). Although it is not the aim of the current paper to test or extend models of behaviour, awareness of such models is important for exploring an individual's behaviour.

Sechrist, Walker and Pender (1987) presented four main categories of exercise barriers: (1) exercise milieu, which concerns the environment limiting participation (e.g., access to facilities, being embarrassed to exercise into front of others), (2) physical exertion, referring to the pain and discomfort of exercise deterring the individual from PA, (3) time expenditure, which concerns the amount of time exercise takes from other commitments, and (4) family discouragement, which reflects family members inhibiting exercise participation. Research concerning university students found that barriers such as lack of family support and unpleasantness of exertion (Daskapan et al., 2006; Lovell et al., 2010) are of high theoretical importance with influence dependent on demographics such as age, gender, and ethnicity. It is apparent that in PA / exercise settings most reported barriers are perceived rather than real (thus within personal control), and are

indicative of priorities. It is therefore likely that individuals who have high control over their lives perceive fewer barriers to exercise.

Certain psychological traits (e.g., extroversion, neuroticism) have been found to predict PA / exercise behaviour. A meta-analysis (Rhodes & Smith, 2006) that included 33 studies examining a range of personality traits found extraversion (i.e., tendency to be lively, energetic, sociable, seek excitement and experience positive affect) and conscientiousness (i.e., tendency to be organised, self-disciplined, and goal-oriented) to be significantly and positively related to PA (r = .23, 95% credibility interval of r = .08, .38; r = .20, 95% credibility interval of r = .06, .34 respectively). In contrast neuroticism (i.e., tendency to be emotionally unstable and anxious) was found to be a significant negative predictor of PA behaviour. When controlling for demographic factors, these reported relationships were found to explain a small but significant proportion of variance. In addition, two other important psychological variables (self-efficacy and self-motivation) have been found to be among the best predictors of PA behaviours, especially in the long-term pursuit of behavioural goals (Buckworth et al., 2013). As such, individual differences in key psychological variables have been found to be important in adopting and maintaining PA / exercise in light of numerous potential barriers that may need to be circumnavigated.

Mental toughness (MT) is defined as a collection of experientially developed and inherent values, attitudes, emotions, and cognitions that influence the way in which an individual approaches, responds to, and appraises both negatively and positively construed pressure, challenge, and adversity to consistently achieve his or her goals (Gucciardi, Gordon & Dimmock, 2009). It is generally agreed MT is a multi-dimensional construct which influences an individual's interpretation of a

situation, and an important resistance resource linked to successful coping in adverse or stressful conditions (Nicholls, Levy, Polman & Crust, 2011). Although appearing similar to other psychological variables (e.g., hardiness, resilience) MT is a distinct construct. For example, whereas a hardy individual copes with challenges which are encountered, a mentally tough individual will seek challenges and even thrive off competition (Strycharczyk & Clough, 2015). Furthermore, hardiness does not consider the role of confidence which is consistently recognised as a key component of MT (e.g. Jones et al., 2002). Differences also exist between MT and resilience. Resilience refers to coping during negatively construed situations and bouncing back, whereas MT incorporates the effect of positively construed situations and thriving on the pressure and challenge (Gucciardi, Gordon & Dimmock, 2008). Clough, Earle, and Sewell (2002) proposed that MT is represented by: (1) control (emotional and life), which reflects a tendency to feel and act as if one is influential, (2) commitment, which concerns deep involvement with whatever one is doing, in contrast to alienation, (3) challenge, refers to the extent to which individuals see problems as opportunities for self-development rather than threats, and (4) confidence (in abilities and interpersonal), reflecting a high sense of self belief and an unshakeable faith in having the ability to achieve success while not being intimidated when dealing with other people. More recently Clough and Strycharczyk (2012) have described MT as trait-like after behavioral genetic research found MT, like most traits, was influenced by a combination of inherited (95% CI of parameter estimates = .30, .62) and non-shared environmental factors (95% CI of parameter estimates = .38, .61; Horsburgh, Schermer, Veselka, & Vernon, 2009). In addition, Horsburgh et al. also found MT to be significantly correlated with all components of the common five factor taxonomy of personality (i.e., extraversion,

conscientiousness, openness to experience, agreeableness and neuroticism; 95% CI of parameter estimates = .35, .68; .16, .60; .07, .43; .17, .58; -.77, -1.00 respectively). Subsequent work has supported the enduring properties, as well the variable nature of MT (Gucciardi, Hanton, Gordon, Mallet & Temby, 2015).

The importance of MT has been demonstrated in a plethora of applied settings such as business, health, and education (Clough & Strycharczyk, 2012). In higher education, MT was recently found to predict academic achievement and progression in 161 first year students; while those with lower MT were more likely to withdraw from their programme (Crust, et al., 2014). In addition, MT was found to predict psychological wellbeing across all levels of undergraduate study (Stamp, et al., 2015). Thus, MT appears to facilitate coping with the challenges associated with transition and the ongoing demands of higher education.

Other work has begun to examine the relationship between MT and PA behaviours given that MT is a multidimensional construct that incorporates aspects such as commitment, self-confidence, and life control, which are likely important to adopting and maintaining target behaviours. Gerber et al. (2012) examined relationships between self-reported PA and MT in 284 high school students (M = 18 years). Higher levels of PA and exercise were significantly and positively related to overall MT and the subscales of life control, commitment and challenge, with those who met current PA guidelines reporting significantly higher MT than those who did not.

Using qualitative interviews with exercisers and exercise leaders, Crust, Swann, Allen-Collinson, Breckon and Weinberg (2014) sought to understand MT in exercise settings. Participants appeared to perceive fewer barriers to exercise; while injury, lack of energy, and time constraints were reported, participants made

sacrifices and were adaptable to ensure exercise goals were achieved. It appears likely that exercisers with high or low MT experience similar potential barriers to exercise, but those higher in MT have somewhat different perceptions (i.e., challenge rather than threat) and appear more adept at coping with life demands to ensure enough time to remain physically active. This finding is consistent with research concerning MT and coping that has found tougher individuals employ more problem-focused coping strategies and less avoidance coping (Nicholls, Polman, Levy & Backhouse, 2008), and were more effective at coping with stressors remaining relatively unaffected (Gerber et al., 2013; Nicholls et al., 2011).

The present study examined relationships between MT and perceived barriers to exercise in undergraduate university students. We hypothesised that students with lower MT would perceive stronger barriers to PA. This population was chosen because the transition from further to higher education is characterised by ambiguity and changing academic, social and emotional demands that require psychological adjustment (Macaskill, 2013; Wynaden, Wichmann & Murray, 2013). There is evidence that levels of moderate and vigorous PA drop significantly following transitions to college or University as other life stressors (i.e., independent living, assignment work, examinations etc.) impinge on lifestyle habits (Bray & Born, 2004; Han, et al., 2008). It is likely that individual differences account for some of this variance, in particular students with higher MT are predicted to perceive their environment and encountered situations as less threating, thus perceiving fewer barriers to overcome. When barriers are encountered students with higher MT are predicted to be better able to cope with the challenges of higher education and thus maintain pre-university lifestyles (e.g., PA). The main aim of the present study is to extend existing work on the relationship between MT and PA by examining self-

reported levels of exercise in university students, and to evaluate perceived barriers to exercise within this population. Examining these relationships could be important in regards to identifying students at risk of adopting more inactive lifestyles and subsequently developing targeted interventions to attenuate the risks (e.g., change perceptions of barriers).

2.0 Method

2.1 Participants

Participants were 173 undergraduate university students (45 males, 128 females) from a range of undergraduate courses across 10 UK institutions. Participants' ages ranged between 18 – 40 years (M = 20.86, SD = 3.39). The majority of the sample was White British; approximately 5% were other ethnicities including Sri Lankan, Zimbabwean, and French. The sample was representative of students from a wide range of courses including Zoology, Fashion and Design, and Sport and Exercise Science. The sample consisted of 63 first years, 45 second years, and 65 third years, with 76% of the sample moving away from the family home to attend university.

2.2 Instruments

2.2.1 Self-reported PA. Initially the International Physical Activity Questionnaire (IPAQ; Craig et al., 2003) was used to record self-reported PA but following reliability issues one of the demographic questions, which asked participants if they partook in regular exercise at least three times a week, was used as an alternative measure. This presented as a dichotomous variable that indicated whether or not participants met pre-specified criteria. Thus, in the present study a regular exerciser was defined as an individual who exercises for 30 minutes or more

at a moderate to vigorous intensity to maintain or improve health / fitness at least three times a week.

2.2.2 Exercise barriers. The exercise barriers scale from the Exercise Benefits and Barriers Scale (EBBS; Sechrist et al., 1987) was used to assess participants' barriers to exercise and took less than five minutes to complete. Although this is an older measure of exercise barriers, contemporary research has demonstrated the barriers appear relevant to current students. For example, pain of exercise (Lovell et al., 2010), family influences (Daskapan et al., 2006), lack of time (Gomez-Lopez, Gallegos & Extremera, 2010), and environmental factors such as lack of resources (Kulavic, Hultquist & McLester, 2013) have recently been reported to inhibit exercise participation. Furthermore, the EBBS has been used in recent research (e.g., Cantell, Wilson, Dewey, 2014; Stroud, Minahna, Sabapathy, 2009). Participants rated the 14 items that describe potential barriers to exercise on a 4-point Likert scale ranging from (1) strongly agree to (4) strongly disagree. The instrument provides an overall score as well as four individual component scores which represents the strength of each barrier (i.e., exercise milieu, physical exertion, time expenditure, family discouragement). Higher scores represented a weaker barrier to exercise. The barriers scale was previously reported to have good internal consistency, construct validity (Brown, 2005), and test – re-test reliability (Sechrist et al., 1987).

2.2.3 Mental toughness. The Mental Toughness Questionnaire (MTQ48; Clough et al., 2002) was used to assess MT and took approximately 10 minutes to complete. This questionnaire consists of 48 items which participants rated on a 5-point Likert scale; ranging from (1) strongly disagree to (5) strongly agree. The instrument provides an overall MT score and a score for the six subscales (i.e.

challenge, commitment, life control, emotional control, confidence in abilities, interpersonal confidence) with higher scores representing greater MT. Some acrimonious debate has ensued about measuring MT, and in particular the appropriateness of using the MTQ48 and the underpinning 4C's model (Clough, Earle, Perry, & Crust, 2012; Gucciardi, Hanton, & Mallett, 2012). While Gucciardi et al. report strong concerns, and have called for use of the MTQ48 to cease, others have highlighted problems associated with applying an overly rigid assessment of model fit with multi-dimensional measures (Hopwood & Donnellan, 2010; Perry, Nicholls, Clough, & Crust, 2015). The MTQ48 has generally been reported to have good criterion, content, and construct validity (Clough et al., 2002); other studies have supported the reported factor structure (Horsburgh et al., 2009) and one large-scale psychometric analysis found broadly adequate psychometric properties (Perry, Clough, Crust, Earle & Nicholls, 2013). However, the reliability of the emotional control subscale has been identified as problematic (Perry et al., 2013). Nevertheless, emotional control is theoretically an important component of MT which should be retained within the model, thus Perry et al. (2013) recommended continuing to use the scale with caution, potentially removing two problem items to achieve better fit indices.

2.3 Procedure

Following ethical approval from a university research ethics committee, six academic staff known to the research team were contacted via e-mail and asked to disseminate to students, a link to the online questionnaire. The link contained an advertisement for students to participate in a study exploring psychological characteristics and lifestyle choices. A broad description of the study was forwarded to avoid a biased sample, for example being more appealing to students who

regularly exercise, and reduce socially desirable responses. Given the relatively equal split of regular exercisers (57%) and non-regular exercisers (43%), it appeared as though the sample was not overtly biased towards exercisers. Staff were from a range of departments and institutes, resulting in students from 10 universities being represented in the current study. The self-paced questionnaire consisted of demographic questions, as well as standardised questionnaires previously described, and took approximately 20 minutes to complete. The order the questions were administrated were: (1) demographic questions (age, ethnicity, changes in PA since attending university), (2) MTQ48, (3) IPAQ, and (4) EBBS. Data collection occurred half way through the academic year. Following completion of the questionnaire an online written debrief was provided.

2.4 Data Analysis

Data was initially screened for outliers and missing variables. Mean, standard deviation, skewness and kurtosis of variables were calculated prior to proceeding with further statistical analysis. Omega point estimates and confidence intervals were used to assess the internal consistency of the questionnaires, as omega holds fewer assumptions about the scale and sampling than alpha (Dunn, Baguley, & Brunsden, 2013). Regular and non-regular exercisers' MT and exercise barriers were compared using independent *t*-tests with 5,000 bootstraps to generate confidence intervals. Pearson correlations explored the relationships between MT and exercise barriers. A path analysis model was examined posited MT components as predictor variables of exercise barriers whilst controlling for age, gender, and year of study.

3.0 Results

No missing data was evident. Tests of univariate normality found all data were within standard limits of kurtosis and skewness (< 2). Descriptive statistics are displayed in Table 1. We calculated Omega point estimates and confidence intervals using the MBESS package (Kelley & Lai, 2012), in R (R Development Core Team, 2012), with 1,000 bootstrap samples.

Subscales of MT had good internal consistency (i.e., > .70) with the exception of emotional control (.49 [95% CI = .28, .60]) and life control (.69 [95% CI = .57, .78). Life control internal consistency was deemed to be at the lower end of acceptability. Inter-item correlation matrix was examined to identify troublesome items of emotional control. Negative correlations were identified between items 26 and 34, which is in line with previous research (Perry et al., 2013) resulting in the removal of these items. This resulted in the five remaining components presenting omega of .60 (95% CI = .44, .66). The remaining items were used as a measure of emotional control in all proceeding analyses. All exercise barrier scales presented good internal consistency, with the exception of family discouragement (.56, 95% CI = .40, .70). This is to be expected, as this subscale only includes two items. These items were reasonably well correlated (.39, 95% CI = .23, .55).

Regular exercisers' overall MT (M = 3.43, SD = .41) was significantly higher than non-regular exercisers' MT (M = 3.26, SD = .55, $p < .05$, d = .35). The regular exercisers reported significantly weaker overall barriers to exercise (M = 3.21, SD = .48) than non-regular exercisers (M = 2.68. SD = .45, $p < .001$, d = 1.14). Differences in overall MT and individual barriers to exercise between regular and non-regular exercisers are presented in Table 2. Although there are statistically significant differences in MT, it should be noticed that these are small effects. Thirty percent of the sample reported a reduction in exercise levels after starting university.

The relationships between MT components and exercise barriers were explored using Pearson's bivariate correlations with 95% confidence intervals achieved from 5,000 bootstrapped samples (Table 1). Overall MT was significantly correlated with overall barriers to exercise (r = .35, 95% CI = .19, .50, p < .01). The strongest relationships existed between exercise milieu and life control (r = .38, 95% CI = .22, .52, p < .01), and exercise milieu and confidence in abilities (r = .36, 95% CI = .20, .49, p < .01) which displayed a moderate relationship.

To determine the extent to which MT variables were predictive of exercise barriers, we examined a path model using Mplus 7 (Muthén & Muthén, 2012). We employed the maximum likelihood estimator and obtained confidence intervals by running 5,000 bootstrapped samples. Age, gender, and year of study where inserted as moderating variables. The results (Table 3) indicated that emotional control negatively predicted exercise milieu (β = -.22, 95% CI = -.45, .02, p < .05) and time expenditure (β = -.24, 95% CI = -.51, .04, p < .05). In contrast confidence in abilities positively predicted the same two exercise barriers (exercise milieu: β = 27, 95% CI = -.05, .53, p < .05; time expenditure: β = .41, 95% CI = 07, .72, p < .01). Physical exertion was positively predicted by commitment (β = .20, 95% CI = -08, .46, p < .05) and there was a non-significant trend to suggest a positive association for physical exertion on confidence in abilities (β = .21, 95% CI = -.10, .51, p = .06). Family discouragement was not predicted by any components of MT.

4.0 Discussion

The main aim of the present study was to evaluate relationships between MT, perceived barriers to exercise, and self-reported exercise behaviour, across a broad range of undergraduate students. Several important findings emerged. First, in support of the main hypothesis, MT was found to be significantly and positively

related to the strength of perceived barriers to exercise ($r = .35$, $p < .01$). That is, participants with lower MT perceived barriers to exercise to be stronger thus more of an obstacle to overcome, or deterrent to exercise. This finding is consistent with previous research that has shown MT to be related to different perceptions during challenging situations (Clough et al., 2002; Levy et al., 2006) and greater optimism (Nicholls et al., 2008). Theoretically this result is important given the role of perceived barriers in predicting actual behaviour in the HBM. The present evidence highlights that individual differences such as MT are important in determining how barriers are perceived, and in turn influence actual behaviour. In terms of barriers, although all barriers were significantly related to MT, exercise milieu (environmental factors) was found to have the strongest relationship. Commitment and control have previously been significantly and positively correlated with meeting PA guidelines (Gerber et al., 2012), which is consistent with the current study that found commitment to be a key distinguishing factor between regular and non-regular exercisers.

Commitment emerged as a key component of MT in the present study and was found to be the strongest predictor of the physical exertion barrier. This is consistent with Crust et al. (2014) who reported mentally tough exercisers were highly committed, exhibited high volumes and intensity of training, enjoyed punishing training schedules, and associated exercise pain positively as an indication of working hard. Crust et al. also found mentally tough exercisers prioritised exercise, organised their time effectively and made sacrifices to ensure exercise goals were achieved. Previous research also identified commitment to be significantly and positively correlated with pain-tolerance, and negatively associated with pain catastrophising during sports rehabilitation (Levy et al., 2006).

Commitment is significantly related to conscientiousness which in turn has been found to be a significant predictor of PA (Rhodes & Smith, 2006).

Confidence in abilities was the strongest predictor of exercise milieu and time expenditure barriers. This is congruent with previous findings that confidence in abilities is related to planning and logical analysis, which enables the individual to transform perceived unmanageable events to appear manageable (Nicholls et al., 2008). Despite family discouragement being significantly related to MT there were no individual MT components which were significant predictors, however this was found to be the weakest barrier to exercise.

Consistent with the findings for MT and exercise barriers, students who participated in regular exercise reported significantly higher MT than those who did not. This result with university students supports previous work that found differences in MT between high school students who reported no days, as opposed to three or more days of vigorous PA per week (Gerber et al., 2012). While Gerber et al. (2012) highlighted differences in coping as one potential explanation, and the possibility that involvement within PA contexts could develop MT, present findings indicate the importance of perceptions. The role of commitment was also reinforced as the factor most clearly differentiating between regular and non-regular exercisers.

As expected, regular exercisers reported significantly weaker barriers to exercise than non-regular exercisers, which shows perceived barriers to exercise is related to actual exercise behaviour. This finding is consistent with the HBM which proposes the associated costs of behaviour (i.e., barriers to exercise) are related to actual behaviour (i.e., exercise). The strongest barrier found amongst the current sample was physical exertion (hard work, associated fatigue) which is consistent with a previous study of non-exercising female UK university students (Lovell et al.,

2010). Similar to previous work (Bray & Born, 2004) current findings identified 30% of students reported decreased exercise behaviour since starting university. It would appear that some students are better able to adjust to the upheavals and challenges of University life. The decline in exercise levels amongst some university students highlights the importance of personal resources in overcoming perceived exercise barriers.

The current findings demonstrate the importance of MT as a predictor of exercise / PA, and provide further evidence that individual differences are part of a complex range of factors that determine exercise / PA behaviours (Rhodes & Smith, 2006). High levels of MT are associated with effective time management, maintaining several commitments at once, doing things which an individual does not want to, working hard, having a sense of purpose, being less influenced by others, perceiving to have control and self-selecting behaviours as opposed to 'drifting' through life (Clough & Strycharczyk, 2012). Furthermore, mentally tough individuals directly address problems (Nicholls et al., 2008) and effectively cope with stressors (Gerber et al., 2013). Thus, these individuals may be more effective at adapting to the challenging environment of higher education and circumnavigating perceived barriers to exercise. In contrast, individuals with lower MT tend to adopt more avoidance coping strategies (Nicholls et al., 2011), and view obstacles as threats to be avoided. This may explain why these individuals perceive stronger barriers to exercise.

One strength of the current study was the inclusion of participants from all three undergraduate years, from a range of subjects, and from across several institutions. Furthermore, adopting a multidimensional approach to measuring MT enabled the effect of individual components to be identified which may help future

researchers to develop and test targeted interventions. Given that present findings identified differences in perceived rather than actual barriers, future researchers may wish to examine the effects of interventions to change perceptions. Similar approaches to those adopted in sport psychology that have shown performance benefits from training participants to perceive anxiety as more facilitative (Hanton & Jones, 1999), may be useful in exercise / PA settings (e.g. learning to perceive exercise fatigue as indication of a beneficial workout). Given present findings, university students with lower MT and those who perceive greater barriers to exercise may benefit from targeted interventions to develop confidence and commitment; two components of MT seen as crucial in regards to achieving exercise goals (Crust et al., 2014). For example, setting goals to enhance commitment to achieve a weekly exercise target (Clough & Strycharczyk, 2012).

Limitations of the present study include the possibility of socially desirable responding, a concern associated with all types of questionnaires. Online data collection is difficult to control in terms of potential influences on respondents (e.g. others being present). Furthermore, only a small percentage of students contacted (around 10%) completed the questionnaire with the majority being female respondents, however, gender was not found to be a significant predictor in the current study. The present study employed a self-report measure of exercise whereas to gain more precise measures future researchers should consider measuring actual PA via methods such as accelerometery. Furthermore, the use of a cross-sectional design provides a snapshot analysis of the relationships between MT, exercise barriers and exercise behaviour, while future work should consider longitudinal designs, to examine behaviours long-term or assess the effectiveness of targeted interventions or environmental manipulation on PA. In addition to modifying an

individual's MT, institutions could make changes to reduce perceived barriers. For example, by promoting convenient times and locations of low cost exercise sessions, or providing sessions which are lower intensity and allow beginners to develop confidence and achieve goals.

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Table 1

Descriptive statistics, normality estimates, internal consistency coefficients, and bivariate correlations

Variable	M ± SD	Skew	Kurt	1	2	3	4	5	6	7	8	9	10	11	12
Overall MT (1)	3.36 ± .48	-.70	1.29	(.92 [.90, .94])											
Challenge (2)	3.54 ± .55	-.51	.55	.77** [.70, .83]	(.70 [.61, .77])										
Commitment (3)	3.49 ± .58	-.51	.55	.79** [.71, .85]	.55** [.42, .66]	(.81 [.75, .85])									
Emotional control (4)	2.86 ± .69	-.06	-.33	.73** [.65, .80]	.60** [.50, .69]	.42** [.26, .55]	(.60 [.44, .66])								
Life control (5)	3.45 ± .56	-.77	1.67	.80** [.72, .86]	.48** [.33, .62]	.63** [.52, .72]	.46** [.32, .57]	(.69 [.57, .78])							
Confidence in abilities (6)	3.14 ± .69	-.42	.04	.85** [.81, .89]	.55** [.42, .65]	.56** [.42, .67]	.63** [.53, .72]	.69** [.59, .77]	(.84 [.79, .87])						
Interpersonal confidence (7)	3.50 ± .75	-.45	-.06	.60** [.49, .69]	.39** [.25, .51]	.29** [.11, .45]	.38** [.24, .50]	37** [.21, .52]	.39** [.25, .52]	(.78 [.71, .83])					
Total barriers (8)	2.98 ± .54	-.05	-.52	.35** [.19, .50]	.21** [.03, .38]	.29** [.12, .44]	.18* [.02, .33]	.36** [.20, .49]	.38* [.23, .51]	.15* [-.01, .30]	(.87 [.83, .89])				
Exercise milieu (9)	3.06 ± .62	-.22	-.42	.35** [.17, .50]	.21** [.01, .39]	.30** [.13, .45]	.16* [-.01, .31]	.38** [.22, .52]	.36** [.20, .49]	.15 [-.02, .30]	.89** [.86, .92]	(.79 [.73, .83])			
Physical exertion (10)	2.48 ± .76	.17	-.36	.25** [.09, .39]	.19* [.03, .33]	.26** [.11, .41]	.18* [.03, .33]	.19* [.03, .33]	.25** [.09, .40]	.04 [-.14, .21]	.66** [.57, .75]	.43** [.28, .56]	(.78 [.71, .83])		
Time expenditure (11)	3.14 ± .75	-.95	.67	.20** [.05, .34]	.09 [-.05, .23]	.09 [-.07, .24]	.07 [-.09, .23]	.21** [.04, .37]	.28** [.13, .41]	.13 [-.04, .28]	.79** [.73, .85]	.61** [.52, .70]	.30** [.15, .44]	(.83 [.75, .87])	
Family discouragement (12)	3.25 ± .68	-.49	-.52	.23** [.09, .36]	.13 [-.01, .28]	.17* [.03, .30]	.14 [-.01, .27]	.25** [.10, .39]	.23** [.09, .37]	.14 [-.02, .29]	.65** [.55, .75]	.44** [.31, .57]	.30** [.15, .44]	.54** [.38, .67]	(.56 [.40, .70])

Note. 95% Bootstrapped confidence intervals presented in brackets. Internal consistency coefficients presented along the diagonal in parentheses. * Statistically significant at $p < 0.05$; **Statistically significant at $p < 0.01$.

Table 2
Independent samples t-test

Variable	Regular exercisers (*n* = 99) (*M* ± *SD*)	Non-regular exercisers (*n* = 74) (*M* ± *SD*)	Mean Diff (95% CI)	*D*
Overall MT	3.43 ± .41	3.26 ± .55*	.18 (.03, .33)	.35
Challenge	3.58 ± .52	3.48 ± .59	.10 (-.07, .27)	.18
Commitment	3.58 ± .52	3.37 ± .63**	.22 (.04, .39)	.36
Emotional control	2.91 ± .64	2.79 ± .75	.12 (-.09, .33)	.17
Life control	3.49 ± .45	3.39 ± .68	.10 (-.08, .28)	.17
Confidence in abilities	3.24 ± .63	3.00 ±.75*	.25 (.03, .46)	.35
Interpersonal confidence	3.60 ± .68	3.38 ± .82*	.22 (.00, .46)	.29
Overall barriers	3.21 ± .48	2.68 ± .45***	.53 (.39, .67)	1.14
Exercise milieu	3.30 ± .58	2.74 ± .53***	.56 (.39, .72)	1.01
Physical exertion	2.70 ± .77	2.20 ± .67***	.49 (.27, .71)	.69
Time expenditure	3.40 ± .58	2.80 ± .81***	.60 (.39, .82)	.85
Family discouragement	3.42 ± .62	3.03 ± .69***	.39 (.19, .59)	.60

Note. A higher MT score represents higher MT, a higher exercise barrier score represents a weaker barrier.
* Statistically significant at $p < 0.05$.
**Statistically significant at $p < 0.01$.
*** Statistically significant at $p < 0.001$.

Table 3
Standardized path estimates with 95% bootstrapped confidence intervals

Variable	Exercise milieu	Physical exertion	Time expenditure	Family discouragement
Challenge	.06 (-.26, .36)	.06 (-.24, .32)	.04 (-.21, .28)	-.01 (-.27, .25)
Commitment	.12 (-.12, .35)	.20 (-.08, .46)*	-.07 (-.32, .18)	.03 (-.23, .30)
Emotional control	-.22 (-.45, .02)*	-.07 (-.33, .19)	-.24 (-.51, .04)*	-.01 (-.29, .27)
Life control	.18 (-.11, .47)	-.05 (-.33, .27)	.03 (-.31, .38)	.13 (-.20, .41)
Confidence in abilities	.27 (-.05, .53)*	.21 (-.10, .51)	.41 (.07, .72)**	.13 (-.20, .46)
Interpersonal confidence	-.02 (-.22, .18)	-.09 (-.33, .17)	.02 (-.23, .25)	.03 (-.20, .26)

Note. * Statistically significant at $p < 0.05$; **Statistically significant at $p < 0.01$.